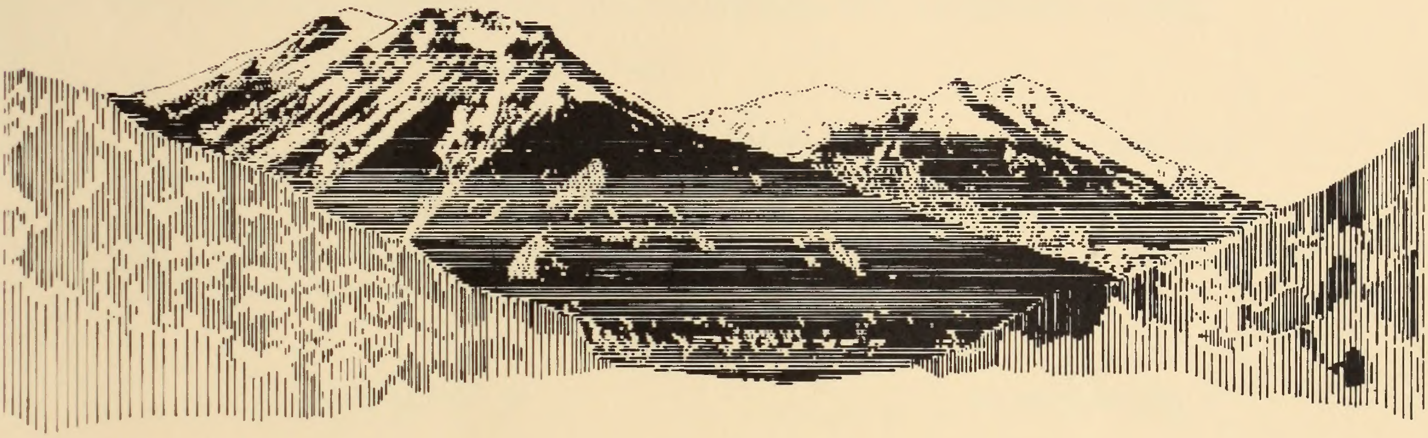
RIFLE TO SAN JUAN 345 - KV TRANSMISSION LINE AND ASSOCIATED FACILITIES



SUPPLEMENTAL DRAFT ENVIRONMENTAL IMPACT STATEMENT

LEAD AGENCY-RURAL ELECTRIFICATION ADMINISTRATION

COOPERATING AGENCIES:

FOREST SERVICE

BUREAU OF LAND MANAGEMENT

WESTERN AREA POWER ADMINISTRATION

JUNE 1983

ERRATA

Supplemental Draft Environmental Impact Statement
for the
Rifle-San Juan 345-kv Transmission Line
and Associated Facilities

Chapter 3.0 - Alternatives Including The Proposed Action

Table 3-10 (Follows page 3-60)

The commercial forest data item and land use resource category score totals for alternatives B and C and their associated 345-kv tap lines for the line section between the Norwood Substation site and the Montezuma-La Plata County Line should be corrected as follows:

Alternative B				Alternative C			
345-kv Transmission Line		345-kv Tap Line		345-kv Transmission Line		345-kv Tap Line	
Miles	Score	Miles	Score	Miles	Score	Miles	Score
21.1	84.4	1.0	4.0	20.1	80.4	10.8	43.2
	102.2		8.0		84.4		47.2

USDA-REA-WAE-EIS (ADM) 83-1-D

Rifle-San Juan 345-kv Transmission Line and Associated Facilities

Supplemental Draft Environmental Impact Statement

Lead Agency:

U.S. Department of Agriculture - Rural Electrification Administration

Cooperating Agencies:

U.S. Department of Agriculture - Forest Service
U.S. Department of Energy - Western Area Power Administration
U.S. Department of the Interior - Bureau of Land Management

Colorado-Ute Electric Association, Inc., Public Service Company of Colorado, and the Western Area Power Administration plan to construct and operate approximately 440 km (275 miles) of single circuit 345-kv transmission line between Rifle, Colorado, and the San Juan Generating Station near Farmington, New Mexico. Associated facilities would include the expansion of existing substations at Grand Junction, Montrose and Durango, Colorado; construction of a new substation near Durango (Long Hollow): addition of termination facilities at the Rifle Substation and the San Juan Generating Station Switchyard; and the construction of approximately 11 km (7 miles) of 115-kv transmission line on double circuit towers from the proposed Long Hollow Substation to the existing Durango Substation. The proposed project would traverse Garfield, Mesa, Delta, Montrose, Ouray, San Miguel, Dolores, Montezuma and La Plata Counties, Colorado and San Juan County, New Mexico.

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List of Abbreviations and Acronyms

ac	alternating current
ACSR	aluminum conductor, steel reinforced
AN	audible noise
AM	Amplitude-Modulated
BLM	Bureau of Land Management
BOR	Bureau of Reclamation
CDOW	Colorado Division of Wildlife
CEQ	Council on Environmental Quality
CFR	Code of Federal Requlations
cm	centimeter
COE	Army Corps of Engineers
Colorado-Ute	Colorado-Ute Electric Association, Inc.
CU	Colorado-Ute Electric Association, Inc.
CRSP	Colorado River Storage Project
db	decibels
dc	direct current
DEIS	Draft Environmental Impact Statement
D&RGW	Denver and Rio Grande Western Railroad
EA	Environmental Analysis
EIS	Environmental Impact Statement
FCC	Federal Communication Commission
FS	Forest Service
gwh	gigawatt-hours (one million kilowatt-hours)
ha	hectares
HCRS	Heritage Conservation Recreation Service
IPP	Inland Power Pool
km	kilometer
kv	kilovolt (one thousand volts)
kwh	kilowatt-hours
m	meter
mA	millampere
MM	Modified Mercalli
mw	megawatts (one million watts)
mwh	megawatts-hours
m^2	square meters
NEPA	National Environmental Policy Act
NESC	National Electric Safety Code
NPS	National Park Service
NRHP	National Register of Historic Places
Plains G & T	Plains Electric Generation Transmission Cooperative
Project	Rifle-San Juan 345-kv Transmission Line
PSC	Public Service Company of Colorado
PSNM	Public Service Company of New Mexico
PUC	Colorado Public Utilities Commission
REA	Rural Electrification Administration

RI	Radio Interference
ROW	Right-of-Way
SCS	Soil Conservation Service
SDEIS	Supplemental Draft Environmental Impact Statement
SHPO	State Historic Preservation Officer
SNRs	Signal-to-Noise Ratios
SRA	state recreation area
SRP	Salt River Project
SSR	subsynchronous resonance
SWA	state wildlife area
TG&E	Tucson Gas & Electric
TVI	Television Interference
USDA	United States Department of Agriculture
USDI	United States Department of the Interior
USFWS	Fish and Wildlife Service
VAC	Visual Absorption Capability
VMS	Visual Management System
VRM	Visual Resource Management
Western	Western Area Power Administration
WPRS	Water and Power Resources Service
WSAS	Wilderness Study Areas
WSCC	Western Systems Coordinating Council

1.0 Summary

1.1 Introduction

In 1979, Colorado-Ute Electric Association, Inc. (Colorado-Ute) proposed to construct and operate a 345-kv transmission line project from Rifle, Colorado to the San Juan Generating Station near Farmington, New Mexico. The Rural Electrification Administration (REA) contacted other governmental agencies and interested organizations to obtain their opinion and guidance in fields which they may have special knowledge or authority (Refer to Appendix A for a more detailed project history). The public was formally requested to provide input at scheduled public meetings held in Rifle, Grand Junction, Delta, Montrose, Norwood, Dove Creek, Cortez and Durango, Colorado, and in Farmington, New Mexico.

A Draft Environmental Impact Statement (DEIS) was issued in July 1981 evaluating a double-circuit 345-kv transmission line and associated facilities from Rifle to the San Juan Generating Station. The project was jointly proposed by Colorado-Ute and the Western Area Power Administration (Western). The preferred route extended from Rifle to the North Fork Valley, to Delta, to Montrose, to Norwood, to Lost Canyon, to Durango and then to the San Juan Generating Station and Western's Shiprock Substation. Alternatives to the proposed project and alternative routes were also identified and evaluated.

REA held three public meetings to obtain comments on the DEIS in August 1981. These meetings were held in Montrose and Durango, Colorado, and in Farmington, New Mexico. Written comments were also received from federal, state and local agencies and interested individuals. In the meanwhile, the Colorado Public Utilities Commission (PUC) denied approval of a Certificate of Public Convenience and Necessity for the proposed project. Consequently, REA decided not to issue a Final Environmental Impact Statement on the proposed project.

Colorado-Ute then developed a coordinated plan with Western and Public Service Company of Colorado (PSC) regarding a southwest Colorado transmission system. Project modifications have been implemented as a result of PUC staff recommendations and input from federal, state and local agencies and the public. A description of the revised proposal which consists of a single-circuit 345-kv Rifle-San Juan Transmission Line and associated facilities is presented in Sections 1.2 and 3.2.

The proposed project originally addressed in the DEIS has been changed from a double-circuit to a single-circuit 345-kv line and

some modifications of route segments over limited portions of the line's length have been made. After studying the revised plan, REA in conjunction with the cooperating agencies: Western, Bureau of Land Management (BLM), and Forest Service (FS): determined that the modifications constituted a substantial change from the originally proposed project that is relevant to environmental concerns. As a result, under the Council of Environmental Quality (CEQ) regulations, 40 CFR Parts 1500-1508, the lead and the cooperating agencies decided that a supplemental DEIS (SDEIS) should be prepared. The purpose of the SDEIS is to evaluate the revised project, alternative corridors and other reasonable options, and allow adequate opportunity for public review of and comment on the revised project. Information and comments received on the original DEIS were considered and utilized in the preparation of the SDEIS. REA intends that the SDEIS can be reviewed essentially on its own as a single integrated document. The SDEIS contains all maps and basic descriptions of the project necessary to review all of the reasonable alternatives under consideration. Material has been incorporated from the DEIS and the applicant's Environmental Analysis. REA, FS, BLM and Western have made an independent review of and have accepted the environmental information used in the preparation of the SDEIS.

The revised project is currently being reviewed by the PUC and the nine involved counties in southwestern Colorado. The public has had the opportunity to comment on the revised project at hearings before the PUC and at county planning commission meetings. The public was also invited to submit additional comments to REA during public information meetings hosted by the applicant in Rifle, DeBeque, Palisade, Durango and Montrose, Colorado in March 1983, and in a Federal Register notice issued by REA. The public will have further opportunity to comment on the revised project and the SDEIS at public hearings to be held after the SDEIS has been issued.

1.2 Scope of the Project

Colorado-Ute, Western, and PSC propose to design, construct, operate, and maintain approximately 440 km (275 miles) of single-circuit 345-kv transmission line from Colorado-Ute's Rifle Substation in Garfield County, Colorado, to the San Juan Generating Station in San Juan County, New Mexico. Associated facilities would include the expansion of existing substations at Grand Junction, Montrose, and Durango: construction of a new substation near Durango (Long Hollow): adding termination facilities at Colorado-Ute's Rifle Substation and at the San Juan Generating Station Switchyard: and the construction of approximately 11 km (7 miles) of 115-kv transmission line on double-circuit towers

from the proposed Long Hollow Substation to the existing Durango Substation. Depending upon system conditions and other developments, the proposed 345-kv transmission line may include a 345-kv tap line to the Lost Canyon Substation, approximately 6.4 km (4 miles) long. If this occurs, facilities would be added at the Lost Canyon Substation. In addition, as may be required by load and system conditions, a new substation may be required in the future near Norwood, Colorado.

The cost, maintenance and capacity of the proposed line would be shared among the three participants in the project. For the line section between Rifle and Grand Junction, the line would be shared as follows: Colorado-Ute--37.5 percent, Western--37.5 percent, and PSC--25 percent. For the line section between Grand Junction and the San Juan Generating Station, the line would be shared as follows: Colorado-Ute--50 percent, and Western--50 percent.

The natural and socioeconomic resources within the study area have been investigated and detailed information is presented in this SDEIS. The analyses include soil characteristics, vegetation, wildlife, land use, cultural resources, socioeconomic resources, visual resources and special interest areas.

Several corridors and line segments between Rifle and San Juan have been identified and evaluated in the environmental process. As a result of these evaluations, the participants chose a preferred corridor (see Figure 1-1) as the most acceptable alternative for the 345-kv line between the Rifle Substation and the San Juan Generating Station to meet their transmission system needs. In addition, the location of the preferred corridor reflects input, to the extent possible, from the federal land managers, county officials, and the public. The preferred corridor consists of alternative segments 3a, 3c, 3i, 3g, 5a, 5b, 12, 14a, 14d, 14c, 17a, 19a, 21, 29a, 29b, 29c, 30b, 30d, 30e, 32a, 32c, 33, 35a, 35c, 36b and 29d (see Figures 3-9, 3-11 and 3-13). The preferred corridor was chosen to avoid known cultural resources and to minimize the impacts on important and prime farmlands, floodplains, wetlands, mineral resources, and other special features as discussed in the SDEIS. In addition, existing rights-of-way (ROWs) were paralleled where practicable to further minimize the environmental impact of the project.

The proposed 345-kv transmission line would begin at Colorado-Ute's existing Rifle Substation and extend approximately 90 km (56 miles) southwest to the Grand Junction Substation. The line would then extend in a southerly direction approximately 83 km (52 miles) to the Montrose Substation. This segment of the line

would parallel Colorado-Ute's 115-kv line for almost all its distance. The line would then extend southerly approximately 67 km (42 miles), to a proposed future substation site near Norwood. Sections of the line would parallel Colorado-Ute's 115-kv line and Western's 230-kv line between the Montrose Substation and the proposed future Norwood substation site. The line would then continue southerly approximately 91 km (57 miles) paralleling Western's 230-kv transmission line to the Montezuma-La Plata County line. From the Montezuma-La Plata County line, the line would extend southeast approximately 27 km (17 miles) to the proposed Long Hollow Substation southwest of Durango. The line would then extend in a southwesterly direction approximately 70 km (44 miles) to the existing switchyard at the San Juan Generating Station.

A single-circuit 115-kv line placed on double-circuit towers is proposed from the proposed Long Hollow Substation near Hesperus to Colorado-Ute's existing Durango Substation. This 115-kv line would extend approximately 11 km (7 miles) east from the Long Hollow Substation site to the Durango Substation.

The basic transmission line structures for the 345-kv line would be steel lattice towers (See Figures 3-1 and 3-2) and would be approximately 35 m (115 feet) in height. The tower height would vary with terrain. The towers would have a base dimension of approximately 84 square meters (900 square feet) and would be anchored by four drilled concrete pier foundations. Typically, there would be 2 to 4 structures per km (four to five structures per mile) with an average span of 366 m (1200 feet). The conductor would consist of a two conductor bundle of nonspecular aluminum cable reinforced with steel. The diameter of each subconductor would be about 3-4 cm (1.5 inches). Two overhead shield wires would be placed on top of the tower structure to provide protection from lightning. Insulators approximately 24 cm (10 inches) in diameter will be used in assemblies to separate the conductors from the support structures.

The structure being considered for the 115-kv line would be a single pole double-circuit structure (See Figure 3-3) and would be approximately 27 m (90 feet) in height. The tower height would vary with terrain. Nonspecular conductor, approximately 3 cm (1 inch) in diameter, consisting of aluminum strands reinforced with steel would be used for each phase.

The right-of-way (ROW) width for the 345-kv line would be a minimum of 46 m (150 feet). Actual ROW width would vary depending on actual location, span length, and conductor sag. Standard transmission line vehicular construction methods would be primarily

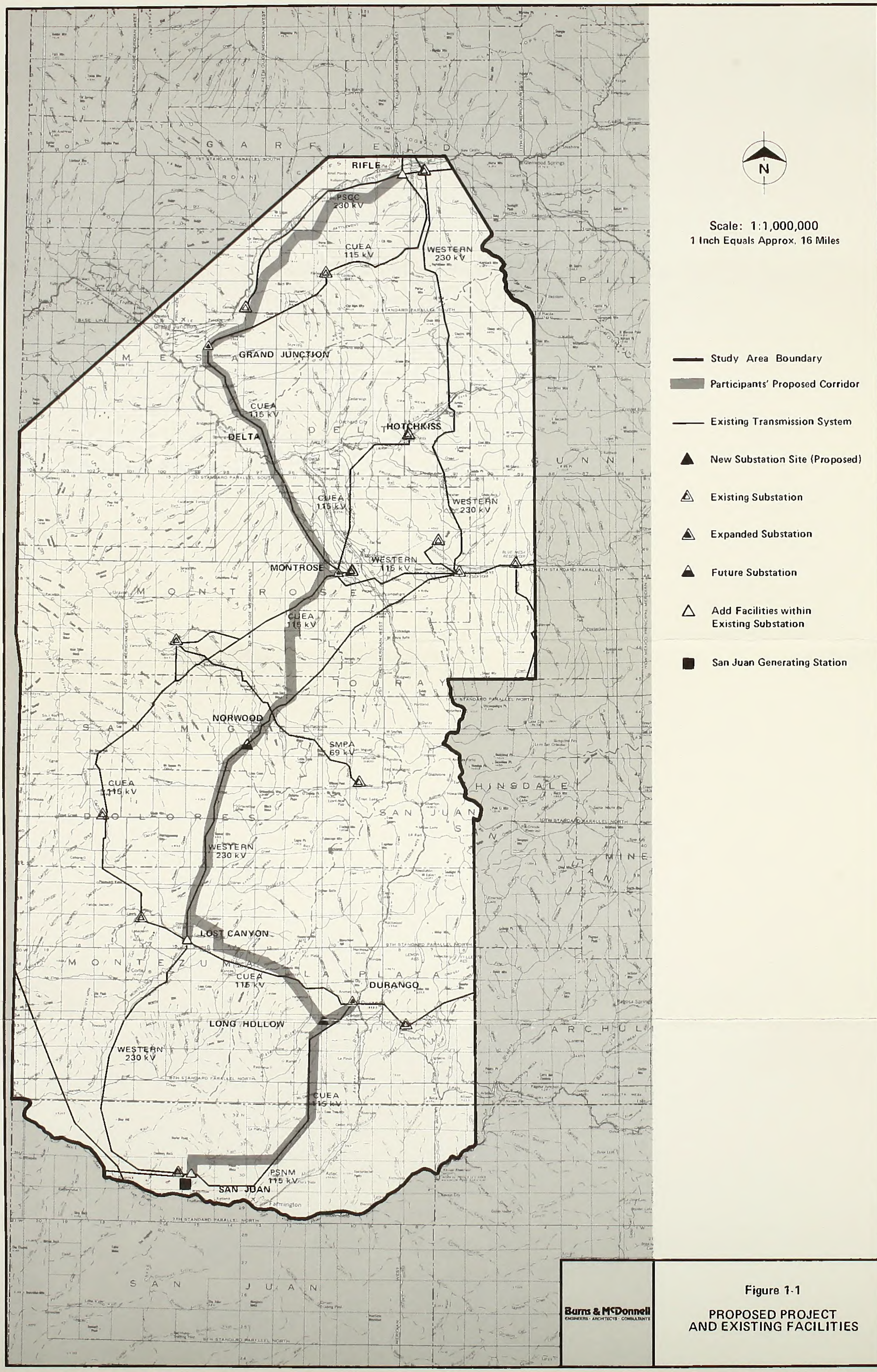


Figure 1-1

PROPOSED PROJECT AND EXISTING FACILITIES

used to construct the lines. Holes for structure foundations would be augered or dug in soil and drilled or blasted in rock. Tension stringing equipment would be employed.

Expansion of the existing substations at Grand Junction, Montrose and Durango would require about 8 ha (20 acres) of land clearing. The new Long Hollow Substation would require about 4 ha (10 acres) of land clearing. Additions to the existing substations would include circuit breakers, reactors, and transformers. Equipment at the new substation would include circuit breakers, switches, transformers, and a control house (See Appendix F). New facilities would be of a low profile design and enclosed by a fence.

Construction is tentatively scheduled to begin in 1984 and be completed in 1986.

1.3 Federal Actions

A number of government agencies may require licensing actions or grant permit approvals during the planning and construction of the proposed project. The REA action would be the possible granting of financing assistance to Colorado-Ute for the construction of the proposed transmission facilities. REA has determined that its proposed action is a major Federal action significantly affecting the quality of the human environment, thus requiring the preparation of an Environmental Impact Statement. This SDEIS has been prepared by REA pursuant to the requirements of 102(2)(c) of the National Environmental Policy Act of 1969, as amended.

REA is acting as the lead agency for the preparation of the EIS. The alternatives are being evaluated to assure that reasonable safeguards would be included to protect the welfare of the public and to assure that all practical environmental protection would be incorporated into the project to mitigate adverse effects. REA procedures require Colorado-Ute to comply with all pertinent environmental requirements imposed by federal, state, and local authorities. Federal considerations in the preparation of the SDEIS include the National Historic Preservation Act, Executive Order 11593: Protection and Enhancement of the Cultural Environment, Federal Clean Air Act, Clean Water Act, the Endangered Species Act of 1973 as amended, the Fish and Wildlife Coordination Act, the Wild and Scenic Rivers Act, Executive Order 11990: Protection of Wetlands, Executive Order 11988: Floodplain Management, and the Secretary of Agriculture's Memorandum No.

9500-2 Revised: Statement on Land Use Policy, dated March 10, 1982.

Other agency responsibilities related to the proposed project are described below.

The BLM would require a grant of ROW to cross lands administered by BLM. BLM is also a cooperating agency in the preparation of the EIS for this project.

The FS would require an Authorizing Document for the ROW to cross National Forests. The Forest Service is also serving as a cooperating agency.

Western, is a participant in this project and a cooperating agency.

The Bureau of Indian Affairs with the consent of the respective tribal council would require an easement to cross Indian lands.

The Federal Aviation Administration would require the submission of a Notice of Proposed Construction or Alteration (Form 7460-1) if the line is located near an airport.

The U.S. Fish and Wildlife Service (USFWS) has reviewed the project and in accordance with Section 7 of the Endangered Species Act has indicated that several threatened and/or endangered species may be present in the area. A biological assessment of these species is being performed and will be submitted to USFWS for review.

A cultural resource survey of the line and access roads would be made and the New Mexico and Colorado State Historic Preservation Officers (SHPO) and responsible federal land managers would be consulted for eligibility determinations and determination of effect pursuant to 36 CFR 800.

The Corps of Engineers would be consulted to ensure compliance with the requirements of Section 404 of the Clean Water Act.

1.4 State and Local Actions

The Colorado Department of Highways would require a utility license before the transmission line could cross a state or federal highway.

The Colorado State Board of Land Commissioners would require a perpetual easement when the proposed project crosses any land under its jurisdiction.

The Colorado Division of Wildlife (CDOW) would require an easement to cross any land under its jurisdiction.

An easement would be obtained if the proposed line crosses any land administered by the Colorado Division of Parks and Outdoor Recreation.

A Certificate of Public Convenience and Necessity would be obtained from the PUC.

The New Mexico Land Office would require a perpetual ROW easement before the line could cross state lands.

The counties in Colorado have been granted land use planning authority by the state. Although the procedures vary among the counties, the county planning commission generally recommends a course of action to the Board of County Commissioners. In turn, the Board of County Commissioners generally issues a decision on the location of a proposed project.

In San Juan County, New Mexico, no permitting requirements exist which apply to facilities like the Rifle-San Juan Transmission Line Project.

1.5 Summary of the Alternatives

1.5.1 Federal Action Alternatives

Alternatives available to REA in this federal action include: 1) approval of financing assistance for the proposed project, 2) approval of financing assistance for the proposed project with conditions, and 3) disapproval of financing assistance for the proposed project. Likewise, the FS and BLM decide whether to approve or deny crossing federal lands and on the location of the corridor on these federal lands. If FS and BLM approve the transmission line on federal lands, a BLM Grant of Right-of-way and a FS Authorizing Document would be issued with various stipulations for construction and operation of the facilities on these lands.

1.5.2 Project Alternatives

In planning the proposed project, Colorado-Ute and its consultant contacted numerous federal, state and local agencies and the public to identify areas of concern and possible alternative routes. A wide range of alternatives were investigated and based on an evaluation of these alternatives Colorado-Ute, Western and PSC concluded that the proposed 345-kv transmission line and associated facilities are the best alternative to meet their present and future needs (see Section 2.0). This project would

meet Colorado-Ute's, Western's and PSC's system requirements (Section 2.0) and would comply with applicable laws and regulations and protect the quality of the environment. Alternatives are presented in Section 3.0 and include:

1. No Action

2. Energy Conservation and Load Management

3. Purchase of Required Power

4. Noncentralized Generation Facilities

5. Upgrading/Rebuilding Existing Transmission Facilities

6. Installation of Series Compensation

7. Transmission System Alternatives Proposed by Others

8. Construction of a 500-kv or 765-kv Transmission Line

9. Construction of a 400-kv Direct Current Transmission Line

10. Construction of an Underground Transmission Line.

11. Construction of a New Transmission Line

    a. Rifle-Grand Junction, Single-Circuit 345-kv; Grand Junction-Shiprock, Single-Circuit 230-kv Transmission Line

    b. Rifle-Grand Junction, Single-Circuit 345-kv; Grand Junction-Shiprock, Double-Circuit 230-kv Transmission Line

    c. Rifle-Shiprock, Single-Circuit 230-kv Transmission Line.

    d. Rifle Shiprock, 2 Single-Circuit 115-kv Transmission Lines.

    e. Rifle-Grand Junction, Double-Circuit 345-kv; Grand Junction-Shiprock, Single-Circuit 345-kv Transmission Line

f. Rifle-San Juan, Double-Circuit 345-kv Transmission Line (Original Proposal).

g. Rifle-San Juan, Single-Circuit 345-kv Transmission Line (Current Proposal).

12. Alternative Corridors

13. Alternative Substation Sites

14. Alternative Structure Designs

1.6 Major Concerns and Issues

Environmental consequences from the proposed action and alternatives were identified and evaluated and appropriate mitigation measures derived. The process involved reviewing and assessing the potential impacts to the existing environment and determining mitigation that would avoid, minimize, or eliminate impacts.

The proposed project would require acquiring approximately 2687 hectares (ha) (5155 acres) of land with the 345-kv line ROW requiring 2025 ha (5000 acres), the 115-kv line ROW requiring 50 ha (125 acres) and the substations requiring 12 ha (30 acres). The total amount of land occupied for the life of the project would be approximately 10 ha (24 acres) for 345-kv transmission line structures and 12 ha (30 acres) for substations. One mile of access road per mile of transmission line could be required to construct the project. Assuming a road 4 m (14 feet) wide, about 0.5 ha/km (2.0 acres/mile) would be disturbed for access roads. Some of these roads would occupy the land for the life of the project.

A small amount of agricultural land would be removed from production. Transmission towers along the preferred corridor would occupy less than 0.2 ha (0.5 acres) of prime farmland, 0.8 ha (2 acres) of irrigated cropland, and 0.4 ha (1 acre) of non-irrigated cropland. The proposal would remove approximately 1,320 ha (790 acres) of forest lands with potential to produce commercial timber.

Socioeconomic impacts might include effects from construction-worker presence, expenditure, and fiscal effects that would result from the construction of the proposed facilities. Temporary accommodations for construction workers could be met with existing facilities in each community and community services would be adequate. Potential indirect-tax revenues from the proposal would be minimal, but would be a beneficial impact of

the proposed project. Increases in property-tax revenues during operation would be a significant long-term beneficial impact. Personal income in the region would rise as a result of project expenditures, which would be a small beneficial impact for the region.

The scenic quality of the area could be reduced whenever transmission towers or substation facilities are visible to an observer. Visual intrusion of the transmission line because of structure contrast (no similar existing structures), landform contrast (new or upgraded access roads and tower-pad construction) and vegetation contrast (vegetation removal), could continue throughout the life of the proposed project. The greatest visual impacts would occur in areas of natural scenic quality, areas in close proximity to residences, travel routes, recreational use areas or other sensitive viewing locations.

Destruction of cultural resources, which are nonrenewable, could be adverse and permanent. The preferred form of impact mitigation for cultural resources is avoidance. This procedure is especially suited for construction of a transmission line. Coordination between the archaeological data collection, the planning of construction and maintenance roads, and the location of tower structures would occur. If avoidance is not possible and the site is listed or eligible for listing on the National Register of Historic Places (NRHP), a mitigation plan that is acceptable to the responsible land manager, SHPO and the Advisory Council on Historic Preservation (ACHP) would be developed and executed as provided by 36 CFR 800.

A thorough literature search to determine known cultural resources has been completed (Nickens 1981 and 1982) and an "on-the-ground" survey of the ROWs, access roads, and substation sites by a qualified archaeologist would be performed, and site-specific mitigative measures would be developed following the discovery of any sites eligible for listing on the NRHP.

No significant potential impacts to air quality would occur. Radio and television reception beyond 90 m (300 feet) of the centerline is not expected to be impaired. The 345-kv line should not pose a biological or health hazard. No published scientific studies to date have shown adverse effects on humans from electrostatic and electromagnetic fields produced by 345-kv lines.

1.7 Agency Preferred Alternative

REA's review and evaluation of the project participants' transmission system proposal concludes that it is a desirable and

necessary project for Colorado-Ute that can be constructed with minimal adverse environmental impacts.

Alternatives to construction and alternative corridors were given consideration throughout the planning process and in the SDEIS. Based on REA's evaluation of the project and on public agency input thus far, REA concludes that the preferred alternative is construction of a single-circuit 345-kv transmission line and associated facilities from Rifle, Colorado, to the San Juan Generating Station near Farmington, New Mexico.

The Agencies (REA, FS, BLM and Western) preferred corridor between Rifle and Grand Junction is alternative H; between Grand Junction and Montrose is alternative B; between Montrose and the Norwood Substation site is alternative A; and between the Montezuma - La Plata County Line and Long Hollow is alternative C. An Agency preferred corridor has not been selected for the two remaining line sections at this time.

2.0 Purpose and Need

2.1 Introduction

The purpose of the proposed project is to provide the bulk transmission capacity necessary (1) for Colorado-Ute to supply power and energy to the loads of its member cooperatives in southwestern Colorado, (2) for Western to transmit power within the Colorado River Storage Project (CRSP) marketing area, (3) for PSC to serve the loads of its customers in the Grand Junction area and along the Colorado River Valley between Rifle and Grand Junction, and (4) to provide for reliable regional integrated system operation. The proposed project will complete a needed extra-high voltage link in western Colorado and northern New Mexico.

Colorado-Ute serves its members with power generated primarily by large mine-mouth coal-fired generating stations located in northwest Colorado. The member loads are located in service areas covering over half of the land area of Colorado, and therefore, Colorado-Ute must operate a transmission system to connect the loads to the generating resources. The proposed project will serve loads in southwest Colorado and interconnect transmission facilities operated by Colorado-Ute, Western, PSC and other power suppliers in Colorado with other facilities in the northwest area of New Mexico. The Project will provide increased capacity for this important transmission link in Western's marketing area and, indeed, the western United States. Presently the Western transmission system in the project area consists of a single 230-kv transmission line, which no longer has sufficient capacity to satisfy system requirements. The proposed Project will improve system reliability for the participants individually and as members of the Inland Power Pool (IPP) and Western Systems Coordinating Council (WSCC). At present, PSC serves the City of Grand Junction and some adjoining areas using a single 230-kv transmission line and local generation. The project will increase the load serving capability of PSC and provide a critically needed alternative power source for the area.

2.2 Colorado-Ute Electric Association, Inc.

Colorado-Ute is an incorporated generation and transmission cooperative association headquartered in Montrose, Colorado. It operates on a nonprofit basis and provides wholesale electric power to 14 all-requirements members whose certificated service territories (Figure 2-1) include all or part of 49 of the state's 63 counties and are located principally in western and southern Colorado. Colorado-Ute and its 14 members constitute the second largest electric supply system in Colorado. Colorado-Ute delivers power to its members over its own transmission system, consisting of approximately 2270 km (1362 miles) of high-voltage

transmission lines and 45 substations, and over the high-voltage transmission facilities of Western and other power supply entities in the region pursuant to a variety of contractual interconnection, wheeling, and displacement arrangements. These facilities and interconnections are depicted in Figure 2-2. The members serve their individual retail customers over their own distribution and subtransmission lines.

2.2.1 Description of Member Loads

Colorado-Ute's members are local consumer-owned electric distribution cooperative associations serving individual retail customers on a nonprofit basis. At the end of 1982, the member systems served approximately 172,000 retail customers. In addition to residential requirements, other electricity-consuming activities in the member service areas are farming and ranching; energy related extraction operations, including mining and oil and gas production; industrial loads, including sawmills, uranium processing plants, and a variety of small manufacturing plants; and skiing and other recreational operations. Sales to Colorado-Ute members in 1982 totaled 2.8 billion kilowatt-hours (kwh). Colorado-Ute's energy sales to the members have increased at an average annual rate of 7 percent during the past six years. Growth of the member loads in the last few years has declined from the long term average due to the recession and particularly poor markets for agricultural products, uranium, base and precious metals, and coal. Unusually warm winters in 1979-80 and 1980-81 resulted in low energy requirements for space heating. Colorado-Ute expects member energy requirements in 1983 to be approximately 7 percent above 1982.

Tables 2-1 and 2-2 show the existing and forecasted loads of Colorado-Ute's members. The forecast for the 14 members is as reported in the 1983 Power Requirements Studies which were recently completed by Colorado-Ute and its members. These studies are being reviewed by REA. The forecast shows member loads (energy requirements) increasing at an average rate of 6 percent during the 1982-1991 period.

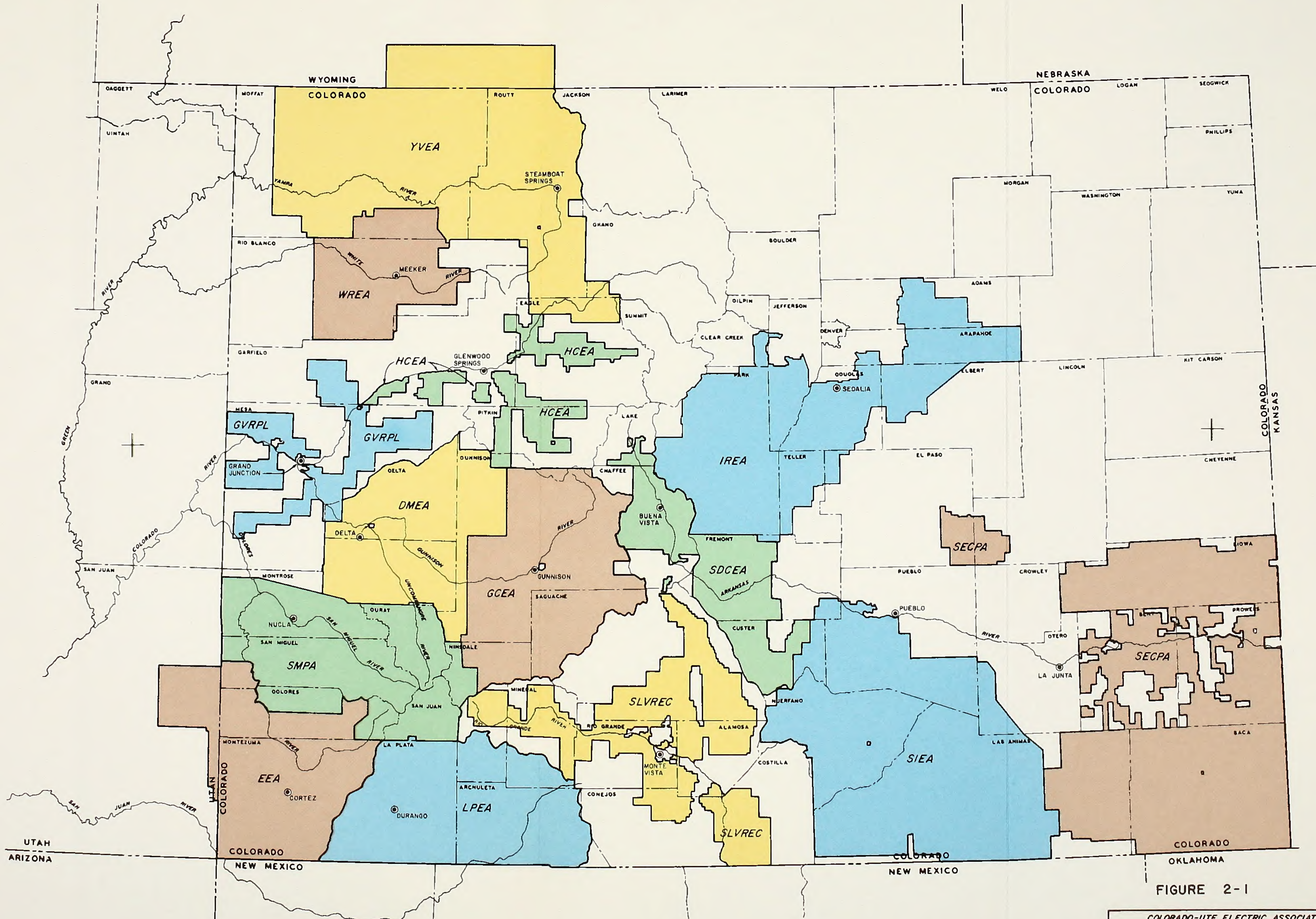
2.2.2 Need for the Project

The purpose of the line is to provide adequate transmission capacity to serve existing member loads in southwest Colorado with a reasonable reserve capacity for expected future load growth. Most of Colorado-Ute's generating capacity has been located in northern Colorado because of coal deposits and water availability in that area. Colorado-Ute's current transmission facilities from the generating stations near Craig and Hayden to the loads in southwest Colorado are inadequate. The proposed

COLORADO-UTE ELECTRIC ASSOCIATION
MEMBER SYSTEMS
CERTIFICATED SERVICE AREAS

KEY TO NAMES

DMEA	Delta-Montrose Electric Association
EEA	Empire Electric Association
GVRPL	Grand Valley Rural Power Lines
GCEA	Gunnison County Electric Association
HCEA	Holy Cross Electric Association
IREA	Intermountain Rural Electric Association
LPEA	La Plata Electric Association
SDCEA	Sangre De Cristo Electric Association
SIEA	San Isabel Electric Association
SLVREC	San Luis Valley Rural Electric Cooperative
SMPA	San Miguel Power Association
SECPA	Southeast Colorado Power Association
WREA	White River Electric Association
YVEA	Yampa Valley Electric Association
⊙	Member System Headquarters



SCALE IN MILES

FIGURE 2-1

COLORADO-UTE ELECTRIC ASSOCIATION, INC.
MONTROSE, COLORADO

MEMBER SYSTEMS
CERTIFICATED SERVICE AREAS

JUNE 4, 1981

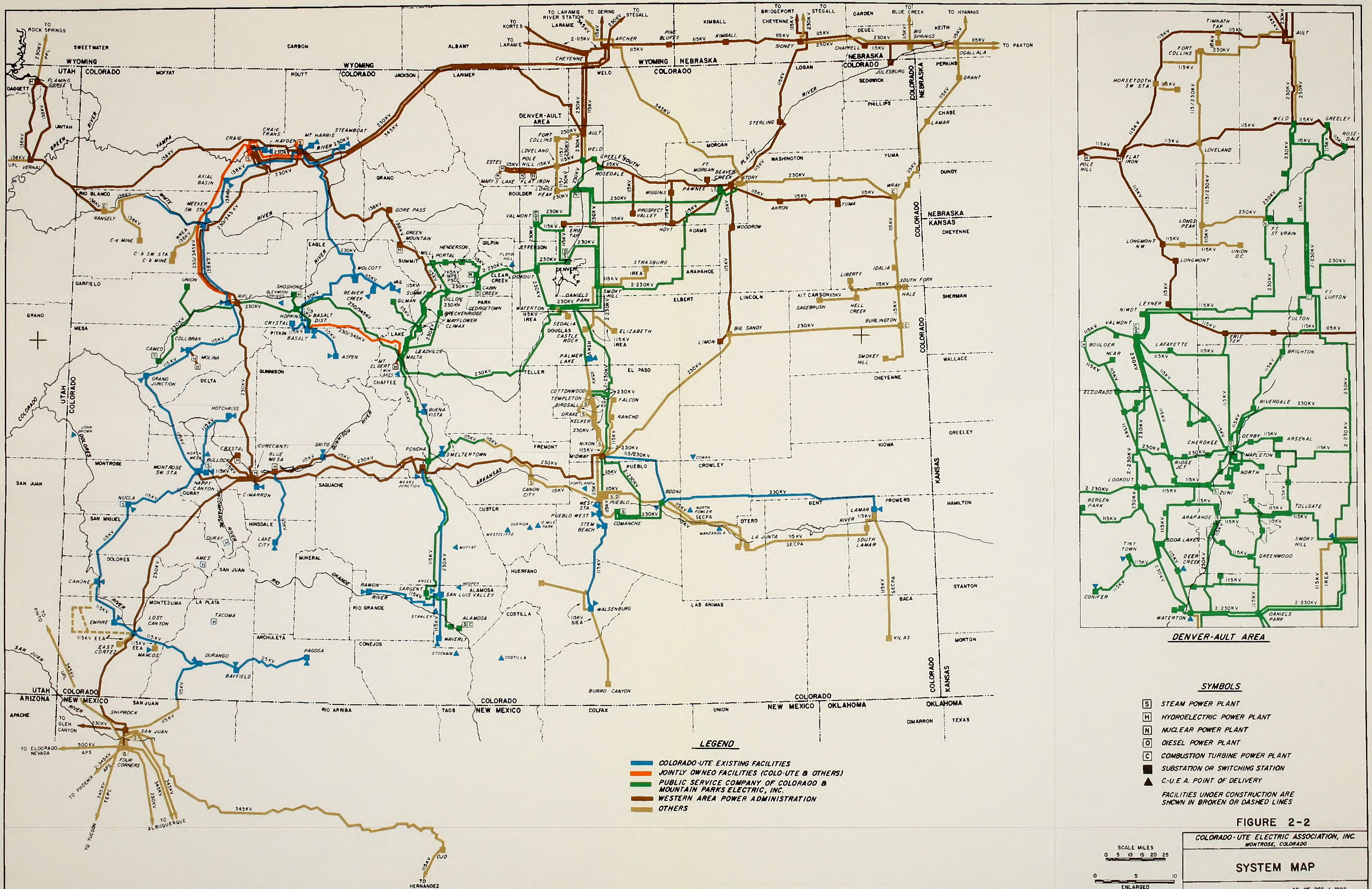


FIGURE 2-2

SYSTEM MAP

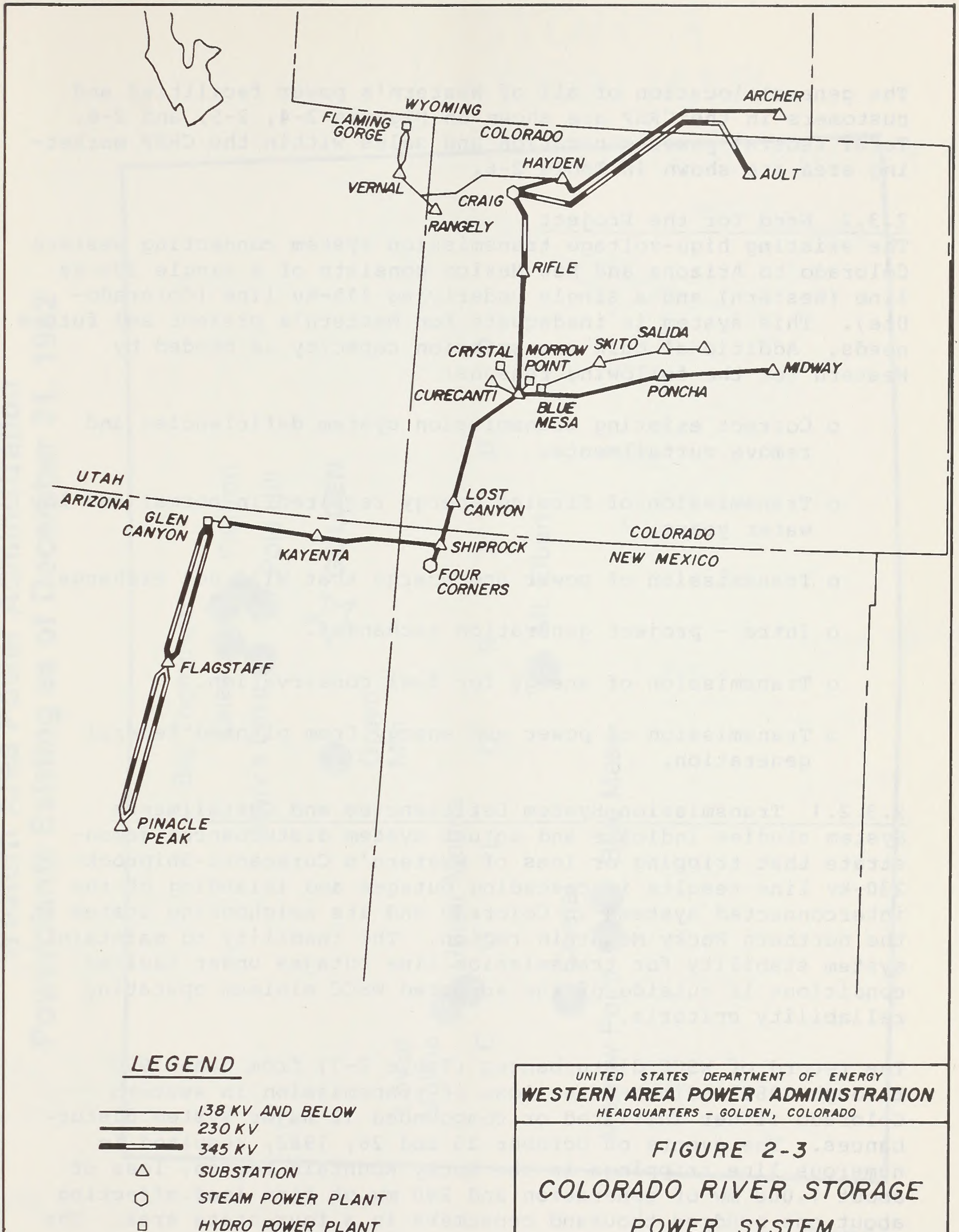


FIGURE 2-3
COLORADO RIVER STORAGE POWER SYSTEM

The general location of all of Western's power facilities and customers in the CRSP are shown on Figures 2-4, 2-5, and 2-6. Total federal power generation and sales within the CRSP marketing area are shown in Table 2-6.

2.3.2 Need for the Project

The existing high-voltage transmission system connecting western Colorado to Arizona and New Mexico consists of a single 230-kv line (Western) and a single underlying 115-kv line (Colorado-Ute). This system is inadequate for Western's present and future needs. Additional bulk transmission capacity is needed by Western for the following reasons:

- o Correct existing transmission system deficiencies and remove curtailments.
- o Transmission of firming energy required in normal and low water years.
- o Transmission of power and energy that will not exchange.
- o Intra - project generation exchanges.
- o Transmission of energy for fuel conservation.
- o Transmission of power and energy from planned federal generation.

2.3.2.1 Transmission System Deficiencies and Curtailments

System studies indicate and actual system disturbances demonstrate that tripping or loss of Western's Curecanti-Shiprock 230-kv line results in cascading outages and islanding of the interconnected systems in Colorado and its neighboring states in the northern Rocky Mountain region. The inability to maintain system stability for transmission line outages under faulted conditions is outside of the accepted WSCC minimum operating reliability criteria.

The record of WSCC disturbances (Table 2-7) from June 1980 through 1982 indicates the loss of transmission in western Colorado either initiated or compounded 12 major system disturbances. The events on October 25 and 26, 1982, resulted in numerous line trippings in the Rocky Mountain Region, loss of about 1,000 mw of generation and 280 mw of firm load affecting about one hundred thousand consumers in a four-state area. The resultant outages ranged from momentarily to as long as three hours. In accordance with WSCC criteria, which the single-line

Western Area Power Administration
Powerplants Existing as of December 31, 1982

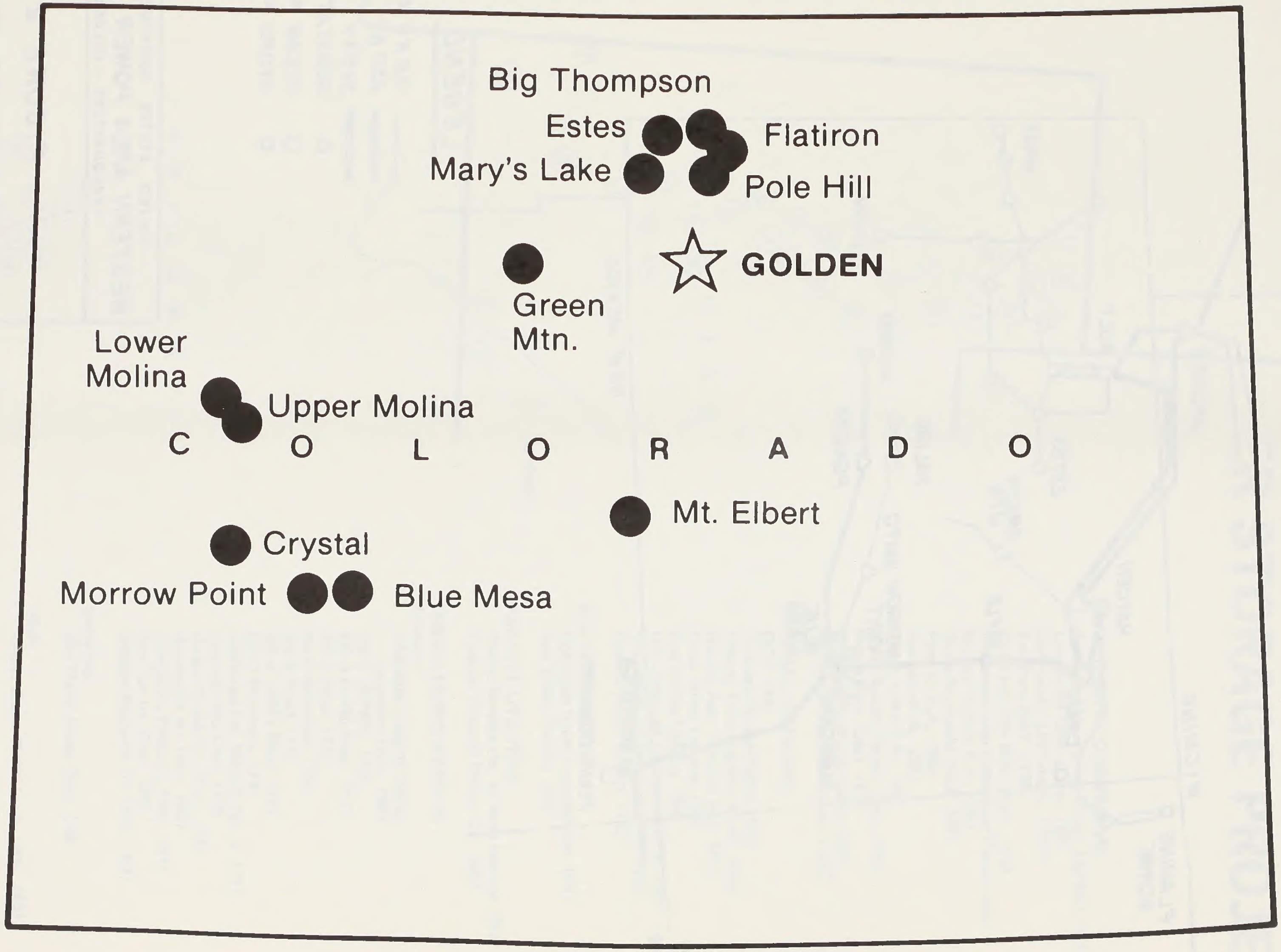
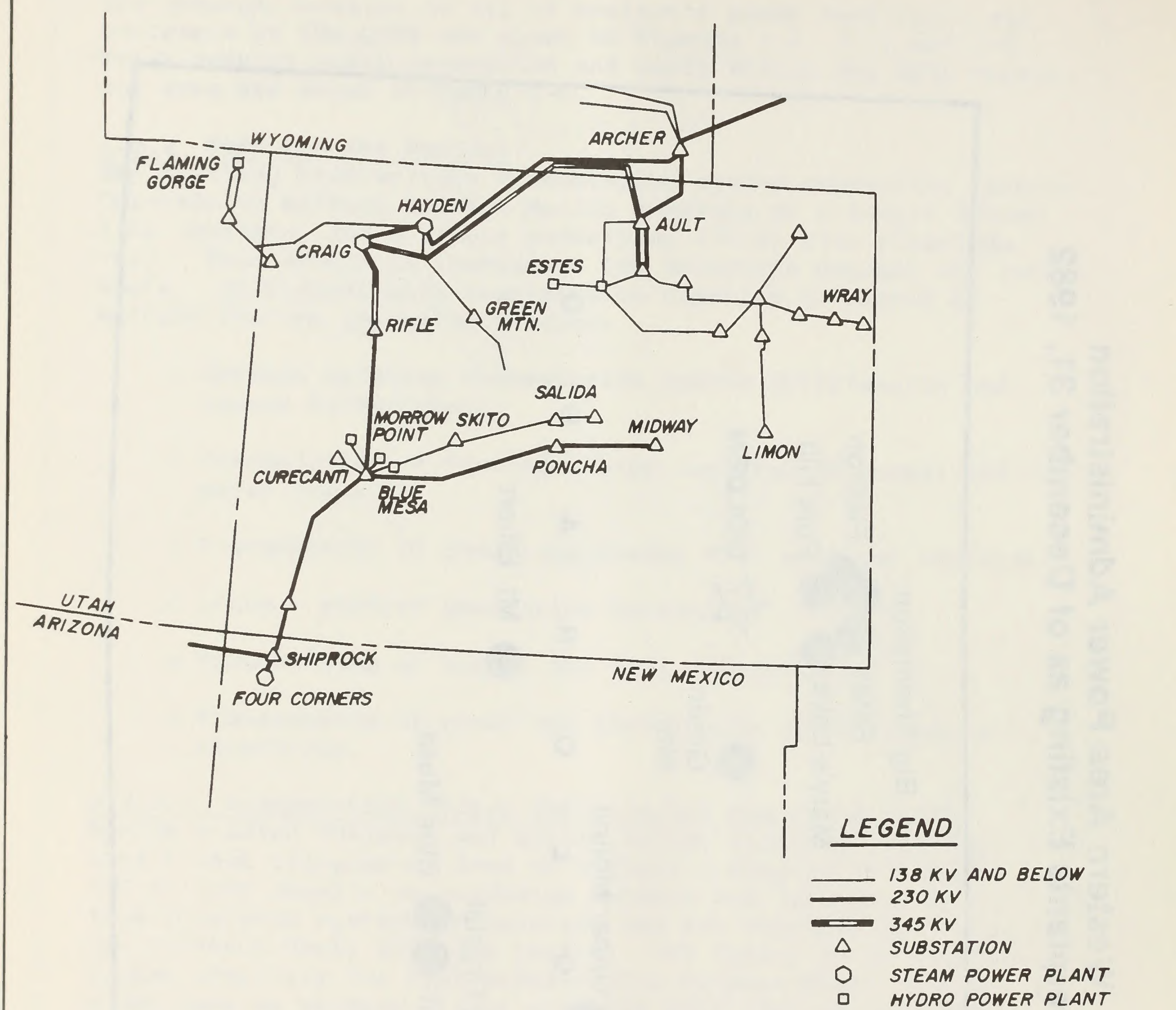


Figure 2-4

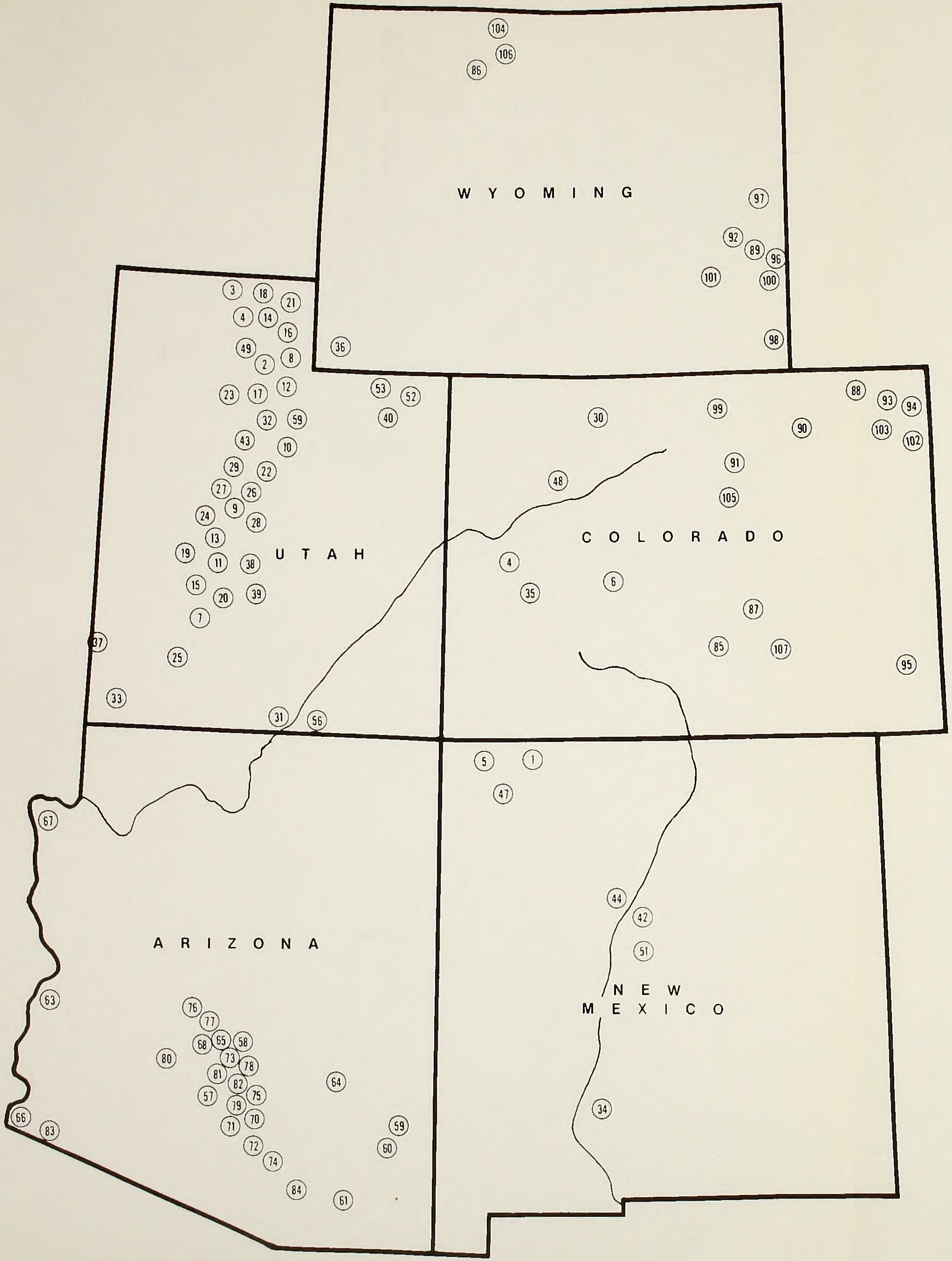


UNITED STATES DEPARTMENT OF ENERGY
WESTERN AREA POWER ADMINISTRATION
HEADQUARTERS - GOLDEN, COLORADO

FIGURE 2-5
COLORADO POWER SYSTEM

DESIGNED ____ SUBMITTED ____
DRAWN ____ APPROVED ____
CHECKED ____

APRIL 26, 1983



CUSTOMER LOCATION MAP

COLORADO RIVER STORAGE PROJECT

MUNICIPALITIES
Arizona
- AK-Chin Indian Comm. (57)
- Page (31)
- Safford (59)
- Thatcher (60)

Colorado
- Center (85)
- Colorado Springs (87)
- Delta (4)
- Fleming (88)
- Fort Morgan (90)
- Frederick (91)
- Gunnison (6)
- Haxtun (93)
- Holyoke (94)
- Lamar (95)
- Oak Creek (30)
- Platte River Power Auth. (99)
- Wray (102)
- Yuma (103)

New Mexico
- Aztec (1)
- Farmington (5)
- Truth or Consequences (34)

Utah
- Bountiful (2)
- Brigham City (3)
- Intermountain Consumer Power Assn.
  - Beaver City (7)
  - Bountiful (8)
  - Ephraim (9)
  - Fairview (10)
  - Fillmore (11)
  - Heber City (12)
  - Holden (13)
  - Hyrum (14)
  - Kanosh (15)
  - Kaysville (16)
  - Lehi (17)
  - Logan (18)
  - Meadow (19)
  - Monroe (20)
  - Morgan (21)
  - Mt. Pleasant (22)
  - Murray (23)
  - Oak City (24)
  - Parowan (25)
  - Spring City (26)
- Levan (27)
- Manti (28)
- Nephi (29)
- Provo (32)
- St. George (33)

Wyoming
- Cody (86)
- Ft. Laramie (89)
- Guernsey (92)
- Lingle (96)
- Lusk (97)
- Pine Bluffs (98)
- Torrington (100)
- Wheatland (101)

RURAL ELECTRIC COOPERATIVES
- Arizona Elec. Power Coop. (APPA) (61)
- Littlefield Elec. Coop. (62)
- Consumers L&P Assn. (104)
- Tri-State G&T (105)
- Colorado-Ute Elec. Assn. (35)
- Intermountain Consumer Power Assn.
- Bridger Valley E.A. (36)
- Dixie-Escalante REA (37)
- Flowell E.A. (38)
- Garkane E.A. (39)
- Moon Lake E.A. (40)
- Mt. Wheeler Power Assn. (41)
- Plains Elec. G&T (42)
- Strawberry Water Users (43)
- Willwood Light & Power (106)

FEDERAL AGENCIES
- DOE (44)
- Defense Depot-Ogden (45)
- Navajo Tribal Utility Auth. (46)
- Navajo Agr. Product Ind. (47)
- Colo. River Indians (63)
- San Carlos Indians (64)
- U.S. Dept. of Defense WAFB (65)
- U.S. Dept. of Defense YPG (66)
- Pueblo Army Depot (107)

STATE AGENCIES
- Colorado River Commission (67)
- Salt River Project (68)

PRIVATE UTILITIES
- Public Service Co. of New Mexico (51)
- Tucson Electric Power Co. (84)

IRRIGATION DISTRICTS
Arizona
- Chandler Heights Citrus Irrigation Dist. (69)
- ED-2 (APPA) (70)
- ED-3 (APS) Pinal (71)
- ED-4 Pinal (72)
- Ed-5 Maricopa (73)
- ED-5 Pinal (74)
- ED-6 (SRP) Pinal (75)
- ED-7 Maricopa (76)
- Maricopa Co. MWCD No. 1 (77)
- Ocotillo WC Dist. (78)
- Queen Creek Irr. Dist. (79)
- Roosevelt Irr. Dist. (80)
- Roosevelt Water C. Dist. (81)
- San Tar Irr. Dist. (82)
- Welton-Mohawk Irr. Dist. (83)

Colorado
- Silt Water Cons. Dist. (48)

Utah
- Weber Basin Water Cons. Dist. (49)

INTERDEPARTMENTAL
- Dutch John Camp (52)
- Flaming Gorge Vistors Center (53)
- Page Municipal (55)
- Page Visitors Center (56)

Figure 2-6

Table 2-6

COLORADO RIVER STORAGE PROJECT POWER PLANTS

PLANT NAME	FY 1982 GROSS GENERATION (KWH)	NUMBER OF UNITS	INSTALLED CAPACITY (KW)
Flaming Gorge	435,305,000	3	108,000
Blue Mesa	185,505,000	2	60,000
Morrow Point	263,494,000	2	120,000
Crystal	162,662,000	1	28,000
Glen Canyon	3,890,564,000	8	1,021,248
	4,937,530,000		1,337,248

SALE OF POWER CRSP

	Municipalities	Rural Electric Cooperatives	Federal Agencies	State Agencies	Inter-Depart-mental	Irrigation Districts	Private Utilities	CRSP Total
Energy sales (MWH)	2,289,653	2,399,661	248,308	503,985	3,844	206,772	6,167	5,658,390
Revenue $	21,413,563	20,087,479	2,674,570	4,101,488	27,296	1,777,364	1,217,243	51,299,003

Table 2-7
RECORD OF WSCC DISTURBANCES

Date	Principal Disturbance Location	CRSP System Affected	Western Colorado North/South Transmission Path Involved
06-24-80	Western Colorado	Yes	Yes[3]
07-09-80	Northwest Power Pool	No	No
07-15-80	Northwest Power Pool	No	No
07-27-80	Northwest Power Pool	Yes	Yes[3]
08-04-80	Rocky Mountain Power Pool	No	No
08-04-80	Sierra Pacific (Nevada)	No	No
08-06-80	Sierra Pacific (Nevada)	No	No
09-24-80	Montana Power Company	Yes	No
10-03-80	Western Colorado	Yes	Yes[2]
12-12-80	Pacific Coast Interties	Yes	No
01-08-81	Utah Power and Light Company	Yes	No
02-23-81	Rocky Mountain Power Pool	No	Yes[2]
03-19-81	Northwest Power Pool	No	No
07-01-81	Bonneville Power Administration	No	No
08-05-81	Western - Loveland-Fort Collins Area	Yes	No
08-10-81	Nevada Power Company	Yes	No
08-20-81	British Columbia Hydro	Yes	Yes[3]
08-29-81	Arizona, Southern California	Yes	No
08-31-81	Rocky Mountain Power Pool	Yes	Yes[3]
11-27-81	Northwest Power Pool	Yes	Yes[3]
12-18-81	Western Colorado	Yes	Yes[1,2]
03-27-82	Pacific Coast Interties	Yes	No
09-08-82	Western Colorado	Yes	Yes[2]
10-22-82	Northwest Power Pool	Yes	Yes[3]
10-25-82	Western Colorado	Yes	Yes[2]
10-26-82	Western Colorado	Yes	Yes[2]
12-22-82	Pacific Coast Interties	Yes	No

[1] Involved only Western Colorado system.
[2] Initiated by Western Colorado system.
[3] Compounded by Western Colorado system.

outage is required to meet, none of the above adverse impacts or actions are allowed.

The short-term method for complying with the WSCC minimum operating reliability criteria has been to establish transmission loading limitations at which the transmission system can be reliably operated. These limits result in an economic penalty to Western and other area power suppliers through reduced power sales, curtailed generation and reduced generating efficiencies resulting from operating coal-fired plants at minimums in order to reduce transmission loading. The long-term solution is the construction of additional high-voltage transmission lines in order to eliminate this system bottleneck.

The existing transmission system is inefficient from the viewpoint of transmission losses, which are extremely high and again result in lost revenue to all area power suppliers. Analyses of the proposed 345-kv line addition with realistic generation schedules indicate an overall reduction of transmission losses in western Colorado by approximately 35 percent. Reactive requirements for voltage support are also high and impose additional burdens on local generating stations.

2.3.2.2 Transmission of Firming Energy Required in Normal and Low Water Years

Historically, the CRSP has needed to purchase large amounts of firming energy in order to meet its contractual commitments for firm power. With minimum water compact releases, these purchases have averaged 1,000 gwh and may be as much as 1,500 gwh in an adverse water year. It is economically advantageous to Western's rate payers that those purchases be made from the most economical generating sources. Recent experience has found the most economical purchases have been from the large coal-fired generating stations in Colorado, Wyoming, and Montana and surplus hydro power available from the Pick Sloan Missouri Basin Program - Eastern Division and the Bonneville Power Administration. Importation of 1,000 gwh of firming energy annually requires an average 24-hour north-to-south schedule of 120 megawatt-hours (mwh) which is usually accomplished by transfer of 200-250 mwh during the principle purchasing periods in the spring. Alternately, purchasing firming energy in the southern area could increase the cost of firming by as much as $10 million per year.

2.3.2.3 Transmission of Power and Energy That Will Not Exchange

Western has contractual loads in Wyoming, Utah, and Colorado, and its major hydroelectric generating resource is at the Glen Canyon Dam in northern Arizona. The Salt River Project (SRP) has loads

in Arizona and shares in the generating resources at the Four Corners Generating Station, Craig Station and Hayden Station. To more efficiently schedule power to serve the loads in both areas, an exchange agreement was established between Western and SRP. This agreement provides for the exchange of 500 mw of SRP thermal generation located in the CRSP Northern Division marketing area with 500 mw of hydroelectric generation at Glen Canyon. The Northern Division generally consists of the four Upper Basin States of Colorado, New Mexico, Utah, and Wyoming. The exchange arrangement benefits the SRP by making possible its participation in low-cost coal-fired generating plants in Colorado and New Mexico without the need to construct transmission to its load in Arizona. It also benefits the United States' CRSP customers in the Northern Division by reducing Federal transmission requirements associated with CRSP load obligations between the Glen Canyon generation and Northern Division CRSP loads. The exchange agreement has been generally effective in accomplishing what was intended during peakload hours, but it has some serious limitations during offpeak hours. The reason this situation occurs is related to the generation patterns and capability at Glen Canyon. First of all, this hydroelectric power plant output is dependent on water conditions, and historically the releases have resulted in approximately a 41 percent plant factor. In order to maximize the benefits from this limited resource, Glen Canyon generation is reduced during offpeak periods often to levels associated with minimum water releases in order to schedule water releases above minimum requirements for the heavier demand onpeak. The thermal plants near Craig and Hayden in northwest Colorado, in which SRP is a participant, have a plant factor of about 70 percent and are loaded at near maximum output during the offpeak periods to maintain operational efficiency. This offpeak energy is transmitted south. Therefore, during offpeak periods the generation involved in the exchange is not balanced, and heavy north-to-south transmission flows are experienced which stress the transmission system. Actual thermal generation levels are limited by the existing transmission capacity as affected by other power system conditions or generation patterns.

2.3.2.4 Intra-Project Generation Exchanges

CRSP resources which are located at Flaming Gorge in northeastern Utah, at the Curecanti Unit in western Colorado, and at Glen Canyon in northern Arizona are interconnected by the CRSP transmission system. The Craig-Rifle-Curecanti-Shiprock transmission line is of particular significance. This transmission system is often utilized to exchange energy among the various CRSP plants wherever water release requirements necessitated by irrigation and flood control, fish and wildlife, or recreational concerns

produces temporary load/generation imbalances at individual powerplants. The excess generation is transmitted to and exchanged with other CRSP powerplants, thus avoiding spills, dumping surplus generation, and incurring energy shortages at later times.

2.3.2.5 Transmission of Energy for Fuel Conservation

Western is involved in a fuel conservation program in which it purchases excess offpeak coal-fired generation in order to maximize its onpeak hydroelectric generation which is then scheduled for sale to other systems (usually in the southwest United States) which use oil and gas generation to meet peak load. The transaction allows the oil or gas generator to be reduced or shut down, thereby saving expensive fuels (frequently displacing imported oil) and providing a savings in power costs to the consumer. The program also enables the utilities providing the offpeak coal-fired energy to keep their units at a more efficient and economic loading level. The sales from the coal-fired plants and resultant additional revenues directly benefit their poewr consumers by holding down power rates.

In order to make this program effective, Western reduces its hydroelectric generation during offpeak periods to the minimums required by water operations and purchases supplementary lower cost energy (usually from generators in the northern end of the CRSP system) to meet its offpeak load obligations. This procedure allows rescheduling of water releases above minimum requirements in order to provide additional generation onpeak. Western's largest reservoir-generating system is at Glen Canyon, which is in the southern end of the CRSP system. Generally, most of the available offpeak surplus coal energy is in the Colorado-Wyoming-Montana area. The transmission system is consequently most severely stressed during offpeak load periods as compounded by the imbalance in generation exchange between Glen Canyon and Craig and Hayden Stations. The inability to transfer offpeak power from these northern coal-fired plants to loads in Arizona and New Mexico requires additional offpeak generation at Glen Canyon, thereby reducing Western's ability to maximize the Fuel Conservation Program.

2.3.2.6 Transmission of Power and Energy from Planned Federal Generation

Current plans indicate that the generating capacity at most CRSP hydroelectric generating stations could be increased by rewinding existing generators and adding new generating units. Within the study area for the proposed project, the Blue Mesa hydroelectric generating station in Gunnison County, Colorado is being considered for uprating and the Crystal hydroelectric plant in Montrose

County, Colorado, is being considered for possible installation of additional facilities. Also, new hydroelectric pumped storage and wind turbine generating facilities are being studied for installation in the CRSP marketing area.

Construction of the proposed Rifle-San Juan 345-kv Transmission Line Project is compatible with transmission requirements of the planned federal generation additions and will result in significant strengthening of Western's high-voltage transmission system in Colorado. The increased capacity and reliability afforded by this Project will provide a resolution to the area's existing transmission system deficiencies and operating and reliability problems. Furthermore, the improvements in system efficiency and utilization will result in considerable financial benefits to both Western and other area power suppliers.

2.4 Public Service Company of Colorado

PSC is an investor-owned utility headquartered in Denver, Colorado. It is the largest electric utility in Colorado and serves approximately 850,000 customers. The service area of PSC includes Denver which is the largest concentration of customers in the state. In addition to Denver, PSC serves a number of cities including several in western Colorado such as Grand Junction, Fruita and Rifle. PSC also serves parts of the sparsely settled area along the Colorado River between Rifle and Grand Junction.

2.4.1 Existing PSC Transmission System in Western Colorado

PSC operates a looped 230-kv transmission system that extends west from the Denver area to the Glenwood Springs area connecting a number of loads and a hydroelectric generating station. From the Glenwood Springs area, a single 230-kv circuit extends west through Rifle to the Cameo Station east of Grand Junction. This line interconnects with other systems belonging to Colorado-Ute, Western and others but is essentially radial with respect to service in the Grand Junction area. Figure 2-2 shows the PSC transmission system in western Colorado.

PSC has completed construction of a new transmission line and substation facilities near Parachute, Colorado for service to the Union Oil Shale Project. This load will be added to the same single 230-kv circuit which serves the Grand Junction area.

2.4.2 Need for the Project

PSC and Colorado-Ute have coordinated their plans for transmission service to the area between Rifle and Grand Junction and have agreed to jointly use the existing PSC 230-kv circuit as a

subtransmission facility so that no new subtransmission system need be constructed. While the existing Rifle to Cameo 230-kv circuit will adequately meet the foreseeable subtransmission system requirements in the area, there is a need for a bulk transmission system to increase the load serving capability and also to provide a second source of power in the area.

The City of Grand Junction and suburban areas contain approximately 85,000 people. Most customers are served by PSC. Part of the rural areas are served by Grand Valley Rural Power Lines, a member of Colorado-Ute. Colorado-Ute serves the needs of its member from its own 115 and 138-kv system. The PSC Grand Junction loads are served by a 69-kv looped transmission system extending west from Cameo Station. This 69-kv system is supported by small generating units located both west (Fruita gas turbine Station-15 mw) and east (Cameo Station - two coal-fired units with a total rating of 75 mw) of Grand Junction. PSC loads in the Grand Junction area were approximately 100 mw during 1982. With an outage of the 230-kv line, the Grand Junction area must be served from the generating units alone. Due to the age and reliability of these units, continuous service cannot be reasonably assumed. Anticipated load growth in Grand Junction by 1985 and/or the oil shale project will increase the area load to a level that cannot be served by the local generation even if all units are operating at full load. In the interim, portions of the 69-kv system will be rebuilt for 230-kv operation but this conversion will not increase the capacity to deliver power into the area from outside sources.

If the existing 230-kv Rifle-Cameo line and the largest unit at the Cameo Station are not in service, the system has only 40 mw available. This generation would be the combustion turbine at Fruita and the remaining small unit at Cameo. PSC's share of the proposed project, plus the 40 mw available, would provide a second sufficient source of power for the Grand Junction area.

2.5 Strengthen the Regional Interconnected Transmission System

Western, Colorado-Ute, and PSC are members of the WSCC which coordinates planning and operations among electrical utilities in a 14-state area in the western United States. WSCC has developed criteria for assessing adequacy and reliability of the WSCC system. The criteria state, basically, that operation of one system must not reduce the adequacy or reliability of adjoining systems. To comply with these criteria, Colorado-Ute, Western and PSC are obligated to provide assurance that planned transmission capacity is consistent with the anticipated operations.

Compliance with the criteria is measured by detailed power system studies. In order to achieve compliance with the criteria in the operation of the existing system, transmission limitations have been established which result in costly curtailments to the power suppliers in the area. Colorado-Ute, Western and PSC, in conjunction with the other area utilities, have performed the necessary power system studies and have determined that the system operations with the proposed Rifle-San Juan project in service will be in compliance with the criteria at substantially higher transmission limits which will not require the imposition of costly curtailments.

Colorado-Ute, Western and PSC of Colorado are also members of of the IPP along with fourteen other members:

- o Salt River Project Agricultural Improvement and Power District
- o Tri-State Generation and Transmission Association, Inc.
- o Platte River Power Authority
- o Basin Electric Power Cooperative
- o City of Colorado Springs
- o Tucson Electric Power Company
- o Wyoming Municipal Power Agency
- o El Paso Electric Company
- o Public Service Company of New Mexico
- o Plains Electric Generation and Transmission Cooperative
- o City of Farmington
- o Arizona Electric Power Cooperative
- o Arizona Public Service Company
- o Deseret Generation and Transmission Cooperative

All of the members of the IPP are owners of electric generation and interconnected transmission facilities, and have agreed to utilize their respective electric systems to the extent capacity is available in a coordinated manner for the benefit of their

respective customers in the service area. The stated benefits to be derived from such coordination include:

- o The combined power loads of the parties' electric systems can be supplied and protected with less aggregate operating reserve capacity and with consequent net savings in expenses.
- o Emergency conditions can be met with less likelihood of curtailment or impairment of electric service to customers or members of the parties.
- o The parties can make more efficient and economical use of generating facilities and interconnections.

This pooling, or sharing arrangement reduces the level of reserve capacity necessary on each individual system, thereby reducing the total amount of installed generating capacity, overall system costs, and environmental impact. Assistance to a requesting party is subject to the availability of energy and the condition that such supply will not result in an impairment of firm power service to the supplying party's system.

For power suppliers to pool or share facilities, there must be an adequate and reliable transmission system in place. Within the IPP, which includes large areas of Colorado, Wyoming, Arizona, and New Mexico, the transmission system in southwestern Colorado has been identified as a "weak link" by certain power pool members.

Studies conducted by Colorado-Ute and Western indicate that the proposed line eliminates the above-mentioned "weak link" between members of the IPP. This would enable the IPP to be more functional and to provide the capability for power suppliers in the area to expand power pooling functions and improve overall system reliability and efficiency.

Presently, the interconnected bulk power systems in the Colorado/ Wyoming area are not adequately connected to systems in surrounding states--a fact which has been observed by the North American Electric Reliability Council and WSCC (NERC, 1982), and which has been documented in studies by Colorado-Ute, Western, and others. Operating experience indicates that in recent times the transmission system connections to other areas have been loaded beyond operationally acceptable limits imposing a risk of wide-spread blackouts. Reserve generating capacity in adjoining states is available to be called upon by Colorado utilities during emergencies, but there is not presently enough transmission system

capacity to deliver the power to Colorado when needed. Conversely, Colorado utilities could aid other areas during emergencies, except for the lack of transmission capacity to transmit the power out of Colorado. The transmission project will eliminate this system inadequacy.

It is the intent of Colorado-Ute, Western and PSC to make excess capacity in the project transmission lines available to other power suppliers in the area through wheeling arrangements, and therefore, the facility is of regional benefit and importance. The project was coordinated with all affected utilities in the area through joint planning studies and through reporting plans to WSCC.

3.0 Alternatives Including the Proposed Action

3.1 Introduction

Several alternatives were considered by Colorado-Ute, Western, PSC and REA. The various alternatives are compared in Table 3.1 with regard to the ability to satisfy the project needs, and environmental impacts. Alternatives that have been considered and eliminated from further analysis include energy conservation and load management, purchase of required power, construction of noncentralized generation facilities, upgrading or rebuilding existing facilities, installation of series compensation to increase the existing system capacity, transmission system alternatives proposed by others, construction of a 500 or 765-kv transmission line, construction of a 400-kv direct current (dc) transmission line and construction of an underground transmission line. These alternatives were eliminated from further analysis because they did not satisfy all the participants' needs, they were not economical, or they were only a temporary solution to meet some of the needs for the project (see Section 3.3).

Transmission system alternatives that would increase capacity to southwest Colorado and reliability of the western Colorado transmission system to the southwest area (see Section 3.4) include construction of the following:

1. Rifle-Grand Junction 345-kv; Grand Junction-Shiprock 230-kv transmission line

2. Rifle-Grand Junction 345-kv; Grand Junction-Shiprock double-circuit 230-kv transmission line

3. Rifle-Grand Junction double-circuit 345-kv; Grand Junction-San Juan 345-kv transmission line

4. Rifle-Shiprock 230-kv transmission line

5. Rifle-Shiprock two single-circuit 115-kv transmission lines

6. Rifle-San Juan double-circuit 345-kv transmission line (original proposal)

7. Rifle-San Juan 345-kv transmission line (proposed project)

Table 3.1. Summary of Alternative System Actions

Alternative	Ability to Satisfy Project Need	Environmental Impact	Included/Eliminated From Further Analysis
Energy Conservation and Load Management	Does not provide system reliability and transmission capacity for southwestern Colorado.	Avoids impacts to environmental resources; however, could result in socioeconomic impacts and curtailment of new service.	Eliminated; dces not meet all project participants' needs, especially increased system reliability.
Purchase of Required Power	Does not provide system reliability and transmission capacity for southwestern Colorado.	Similar to proposed project since new transmission would have to be built.	Eliminated for above reason.
Noncentralized Generation Facilities	Does not provide system reliability and is not economical.	Impacts to air and water quality and other impacts associated with power plant construction. Requires additional transmission line construction.	Eliminated for above reason.
Upgrading/ Rebuilding Existing Transmission Facilities	Existing facilities can not be taken out of service and maintain service to areas. Impractical to remove lines from service for an extended period of time. Requires more substation facilities than proposed project.	Minimal impacts. Some new right-of-way required. May also require additional transmission line construction.	Eliminated; it is impractical to remove lines from service for extended periods of time.
Installation of Series Compensation	Provides additional transmission capacity; short-term solution would not be economical; would not provide system reliability. System losses would increase.	Minimal impacts	Eliminated; would serve only as a short-term solution, and increase system losses.
Transmission System Alternatives Proposed by Others	Provides additional capacity for Colorado-Ute, but may decrease capacity for Western and PSC. Increases system reliability and system losses.	Similar to the proposed. Construction of a new transmission line from Lake City to Durango would impact high visual and potential wilderness areas.	Eliminated; would only provide short term solution. Cost would also be high and may actually decrease Western and PSC capacity.
Double Circuit 345-kv Transmission Line	Satisfies needs of Colorado-Ute and Westen. Line would have to be routed via Grand Junction to meet PSC needs.	Similar to the proposed. (See Section 5.0)	Eliminated; unable to obtain Certificate of Public Convenience and Necessity. Area loads have also decreased making the project uneconomical.
No Action	Does not provide system reliability; does not increase capacity to load centers.	Same as energy conservation.	Included; however will not meet the needs of project participants. Probably would require each participant to construct its own facility.

Table 3.1. Continued

Alternative	Ability to Satisfy Project Need	Environmental Impact	Included/Eliminated From Further Analysis
Proposed Project (345-kv line and Associated Substations)	Provides system reliability, transmits power to identified load areas.	Visual impacts. Some loss of prime farmland and commercial forest land. Disturbance of some cultural resources. (Impacts dis- in detail in Sec. 5.0)	Included.
Construct 230-kv Line from Rifle to Shiprock (System Alternative)	Provides system reliability but not the necessary capacity for all participants. Additional lines needed in the near future.	Impacts similar to the proposed project.	Included; however, would not meet needs of all participants.
Construct 500-kv or 765-kv line from Rifle to San Juan (System Alternative)	Provides needed reliability and capacity, but not compatible with existing bulk transmission system in area. Increased costs for facilities including transformation to lower voltages.	New ROW. More ROW than 345-kv line. Impact similar but greater than the proposed project.	Included; however, more costly and not compatible with existing system.
Construct a Direct Current (DC) transmission line (System Alternative)	Provides reliability and additional transmission capacity; however, construction is not economically justifiable for the distance involved and substation needed for serving area loads.	New ROW. Impacts similar to the proposed project.	Included, but not justifiable economically.
Construct Rifle-Grand Junction 245-kv, Grand Junction-Shiprock 230-kv Transmission Line	Provides system reliability, and meets PSC's needs; however, would not provide additional capacity for Western.	Similar to proposed. (See Section 5.0) would also require additional transmission facilities.	Included; however, would not meet needs of all participants.
Construct Rifle-Grand Junction 345-kv; Grand Junction - Shiprock Double Circuit 230-kv Transmission Line	Provides system reliability and meets participants' needs.	Similar to the proposed.	Included; however would be more costly because of double circuit structures.
Construct 2 Rifle-Shiprock 115-kv Transmission Lines	Provides system reliability but would not serve Western or PSC needs.	Similar to proposed; however, two lines would be constructed. PSC and Western would have to construct separate facilities.	Included; however, only satisfies the needs of Colorado-Ute

The no action alternative is discussed in Section 3.5. Several alternatives (see Section 3.6) within the proposed action were considered and include alternative substation sites, corridors, and structure designs.

3.2 Description of the Proposed Facilities

3.2.1 Project Description

The participants' preferred transmission corridor from Rifle, Colorado, to the San Juan Generating Station near Farmington, New Mexico, consists of the following segments: 3a, 3c, 3i, 3g, 5a, 5b, 12, 14a, 14d, 14c, 17a, 19a, 21, 29a, 29b, 29c, 30b, 30d, 30e, 32a, 32c, 33, 35a, 35c, 36b, and 29d (see Figures 1-1, 3-9, 3-11, and 3-13).

The proposed 345-kv transmission line would begin at Colorado-Ute's existing Rifle Substation and extend approximately 90 km (56 miles) southwest to the Grand Junction Substation. The line would then extend in a southerly direction approximately 83 km (52 miles) to the Montrose Substation. This segment of the line would parallel Colorado-Ute's 115-kv line for almost all its length. The line would then extend in a southerly direction approximately 67 km (42 miles) to a proposed future substation site near Norwood. Sections of the line would parallel Colorado-Ute's 115-kv line and Western's 230-kv line between the Montrose Substation and the proposed future Norwood Substation site. The line would then extend in a southerly direction approximately 91 km (57 miles) paralleling Western's 230-kv transmission line for approximately 59 km (37 miles) and then located in a new corridor to the Montezuma-La Plata County line. From the Montezuma-La Plata County line, the line would extend east and then south approximately 27 km (17 miles) to the proposed Long Hollow Substation southwest of Durango. The line will then extend in a southwesterly direction approximately 70 km (44 miles) to the existing switchyard at the San Juan Generating Station.

The proposed transmission line would be single-circuit 345-kv line utilizing steel lattice towers as the standard support structure. Currently, two tower types are being evaluated by the participants. One type is a lattice type structure with the phases arranged in a delta configuration as shown in Figure 3-1. The other is a lattice type with the phases arranged in a horizontal phase configuration as shown in Figure 3-2. These structure types are being evaluated on the basis of optimizing the overall economic and electrical performance. The preferred tower design will be selected on the basis that its performance will provide acceptable levels of radio/television interference, audible noise, ozone and electric-field while providing the

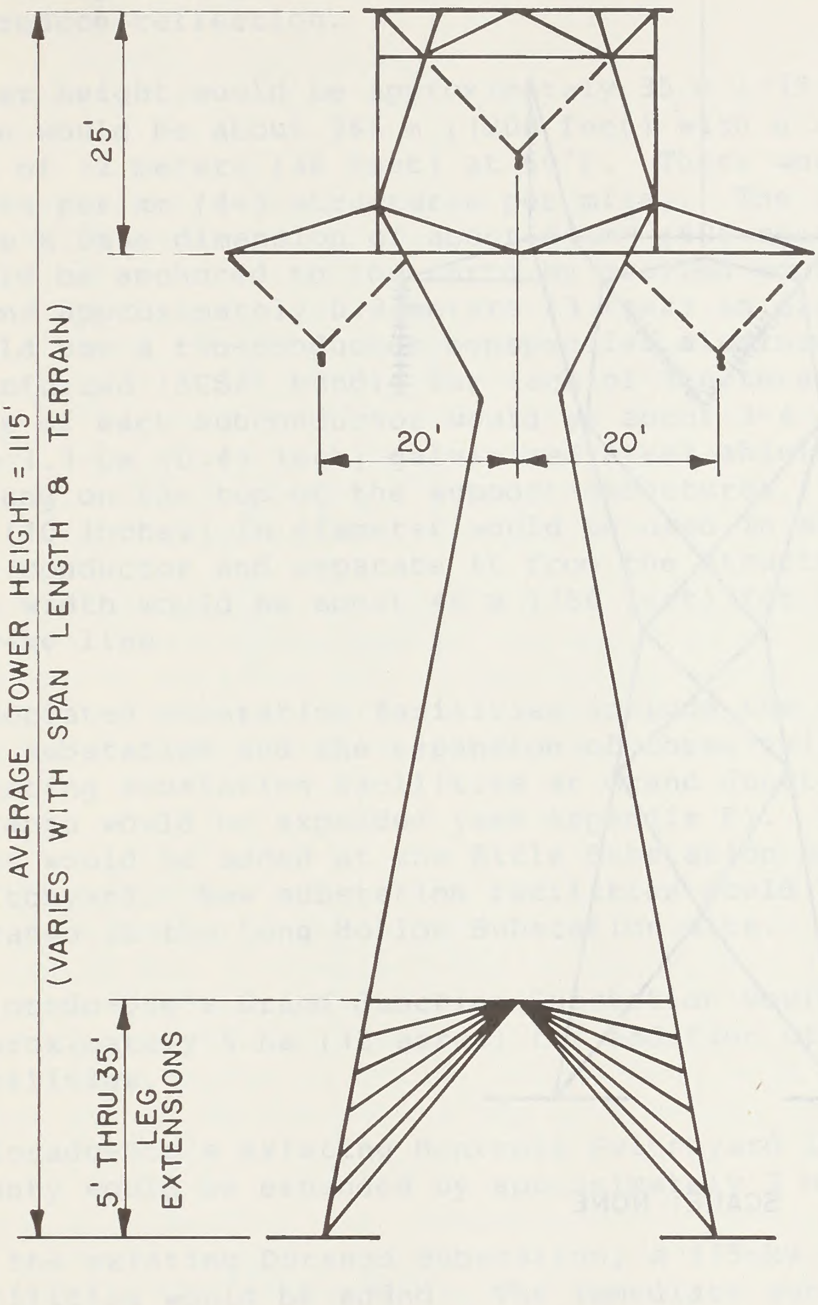


FIGURE 3-1
RIFLE - SAN JUAN 345 kV LINE
SINGLE CIRCUIT TOWER

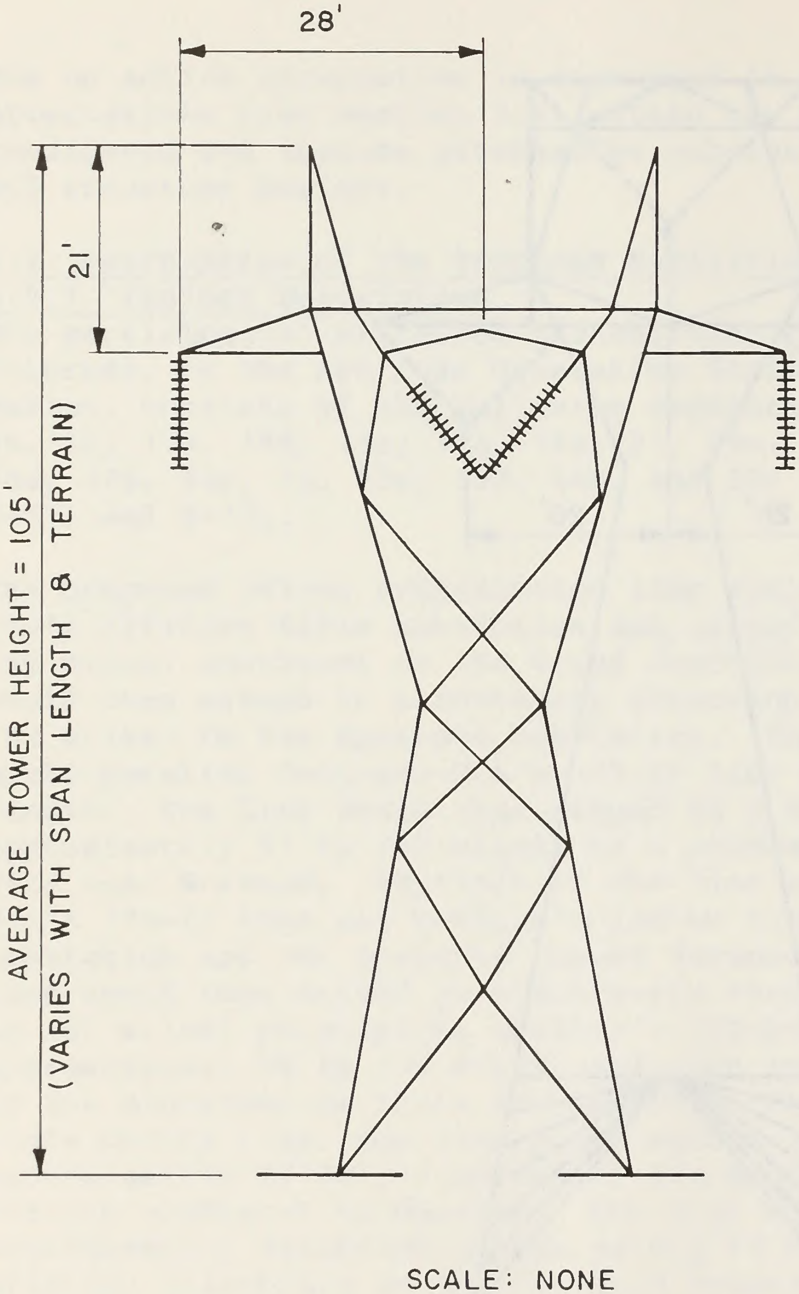


FIGURE 3-2
RIFLE - SAN JUAN 345 kV LINE
SINGLE CIRCUIT TOWER

lowest operating cost. The tower would have a nonglare coating to reduce reflection.

Tower height would be approximately 35 m (115 feet). The average span would be about 366 m (1200 feet) with a nominal conductor sag of 12 meters (40 feet) at 60°F. There would be 2-4 structures per km (4-5 structures per mile). The structures would have a base dimension of about 84 m^2 (900 square feet) and would be anchored to the earth by drilled concrete pier foundations approximately 0.9 meters (3 feet) in diameter. The line would use a two-conductor nonspecular aluminum conductor, steel reinforced (ACSR) bundle for each of its three phases. The diameter of each subconductor would be about 3-4 cm (1.5 inches). Two 1.1 cm (0.43 inch) galvinized steel shield wires would be strung on the top of the support structures. Insulators about 24 cm (10 inches) in diameter would be used in assemblies to support the conductor and separate it from the structures. The right-of-way width would be about 46 m (150 feet) for the single circuit 345-kv line.

Associated substation facilities include the construction of one new substation and the expansion of three existing substations. Existing substation facilities at Grand Junction, Montrose and Durango would be expanded (see Appendix F). Termination facilities would be added at the Rifle Substation and the San Juan Switchyard. New substation facilities would be constructed near Durango at the Long Hollow Substation site.

Colorado-Ute's Grand Junction Substation would be expanded approximately 5 ha (12 acres) for addition of 345- and 230-kv facilities.

Colorado-Ute's existing Montrose Switchyard located in Montrose County would be expanded by approximately 3 ha (8 acres).

At the existing Durango Substation, a 115-kv bay and terminal facilities would be added. The immediate substation area would be expanded about 0.2 ha (0.5 acre).

A new 345/115-kv substation would be constructed near Durango in La Plata County (Long Hollow Substation). The immediate substation area would require approximately 4 ha (10 acres) of land.

Public Service Company of New Mexico's existing switchyard at the San Juan Generating Station in San Juan County, New Mexico, would not be expanded, but termination facilities would be added in the existing yard.

The substation facilities would be low profile with a rigid bus design. The substation facilities would be enclosed by a fence. Typical substation facilities include breaker bays, circuit breakers, transformers, reactors, circuit switchers and a control house (see Appendix F).

A single-circuit 115-kv line placed on double-circuit structures would be constructed from the proposed Long Hollow Substation near Hesperus to Colorado-Ute's existing Durango Substation. This transmission line would extend 11 km (7 miles) east from the Long Hollow Substation to the Durango substation site using Corridor Segment 39. The proposed line would utilize a single-pole support structure (Figure 3-3). Tower heights would be approximately 27 m (90 feet) with an average span length of 152 m (500 feet). The line would use a single nonspecular ACSR conductor for each phase and be shielded by an overhead ground wire.

If large loads develop rapidly in the areas served by the Lost Canyon Substation and Western has not uprated its 230-kv line to 345 kv, the proposed 345-kv transmission line would be extended to the Lost Canyon Substation from north of Dolores, Colorado. Transformation facilities would be added at Lost Canyon Substation in this event.

3.2.2 Construction Methods

Construction methods for both the 345-kv and the 115-kv lines would be essentially the same. Construction of a transmission line normally follows a sequence of ROW preparation and access road construction, foundation installation, material delivery, tower assembly, tower erection, conductor and shield wire stringing, tensioning, and site restoration. Prior to actual construction, extensive aerial photography and on-the-ground survey work must be completed.

The line is to be built in three sections, and Colorado-Ute has estimated that the construction would require several crews totaling approximately 150 to 200 men per section. This crew would typically be split into smaller units, each involved with a different construction activity. These units are generally distributed over 80-120 km (50-75 miles) of the line.

One unit of the construction crew would be involved with preparing the ROW, developing access, and installing gates where necessary. A second construction unit would follow to install the foundations. This involves augering or blasting holes for the structure foundations, and filling with concrete. The next task is material delivery and steel layout. Large and bulky materials

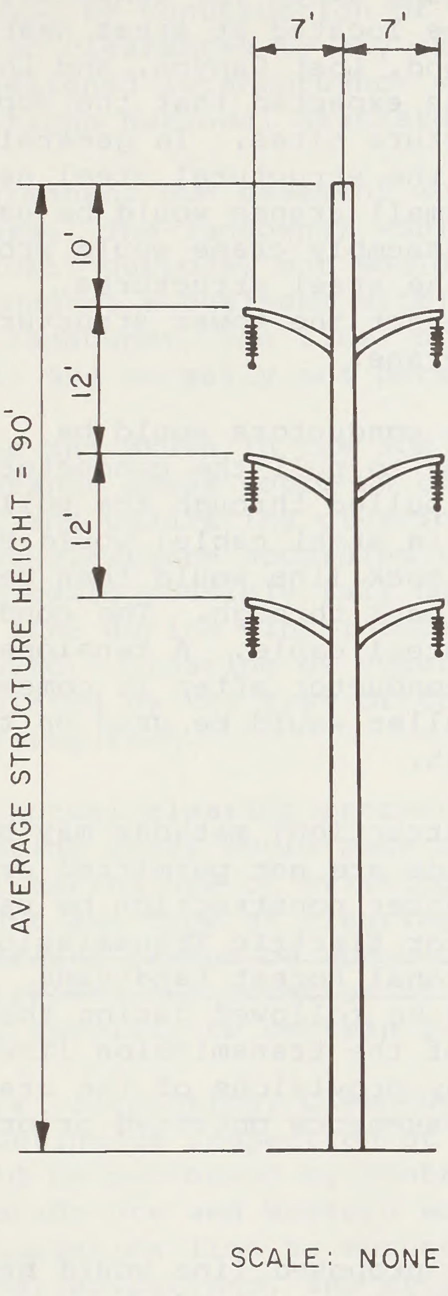


FIGURE 3-3
RIFLE - SAN JUAN 345 kV LINE
SINGLE CIRCUIT TOWER

would be delivered by rail to railheads and then delivered by conventional vehicles to each site. Staging areas for temporary material and equipment storage would be located at areas near the Rifle, Grand Junction, Montrose, Norwood, Lost Canyon, and Long Hollow Substations. At this time it is expected that the support towers would be assembled at the structure sites. In general, flat-bed trucks would be used to haul the structural steel needed for the towers to the site areas and small cranes would be used to unload the structure components. An assembly crane would probably be used to help assemble portions of the steel structures. Another construction unit would then erect the tower structures onto the foundations using a setting crane.

After the structures are in place, the conductors would be strung. A series of steps are required to pull the conductor in under tension. First a rope would be pulled through the pulleys located on each tower. The sock line (a steel cable) would be pulled back through by the rope. The sock line would then be used to pull a larger diameter steel cable back through. The conductor would then be pulled in by the large steel cable. A tensioner would be used to keep tension on the conductor after it comes off the conductor spool and a conductor puller would be used on the other end to pull the conductor through.

Nonconventional (i.e., helicopter construction) methods may be used in areas where conventional methods are not permitted or where the terrain dictates that helicopter construction be used. Guidelines in Environmental Criteria for Electric Transmission Systems (USDA and USDI, 1971) and National Forest Landscape Management-Utilities (USDA 1975) would be followed during the construction, operation and maintenance of the transmission line. Colorado-Ute would also be regulated by provisions of the grants of ROW, Special Use Permits, and ROW easements obtained prior to construction.

3.2.3 Right-of-Way Considerations

The minimum ROW width required for the proposed line would be 46 m (150 feet). Up to 91 m (300 feet) would be acquired where private landowners are willing to grant additional easement rights sufficient to allow construction of a possible future second 345-kv line. In certain areas where there is a physical, environmental or land use restriction to a single-tower ROW corridor, structures that can support another future circuit may be constructed. On federal lands, permits would be requested only for the immediate single-circuit proposal. However, the federal agencies are being informed of the possible need for an additional, adjacent ROW for a second line at some future date. All easements acquired would

provide for payment of damages to crops and certain other items damaged by construction of the transmission line. Mid-span conductor clearances to any existing buildings or structures would be designed in accordance with the National Electric Safety Code (American National Standard Institute, 1981).

A permanent ROW easement would be purchased from private landowners. The landowner would be able to use the ROW for any agricultural purpose, but would not be permitted to erect structures or conduct a business within the ROW, which would be hazardous to the landowner, the line, or the general public. Permanent structures are normally not permitted in any part of the ROW.

Trees and brush in the ROW that intrude into the conductor clearance areas would be cut back by means of topping, feathering, and undulating clearing. This is necessary to provide adequate clearance according to NESC standards, and to remove trees that could possibly fall on the line. Trees that could affect the line during wind-induced swing would also be topped or removed. Clearing of vegetation for conductor clearance would be regulated by the type of tree to be topped and the amount of topping required.

The normal clearing procedure is to top or fell large trees. Clearing crews would make a minimal number of passes through the ROW, making use of existing access roads where possible. The amount and type of clearing or grading required for electrical clearance cannot be accurately estimated prior to a survey of the centerline and location of structures since these activities are very specific to certain locations.

3.2.4 Inspection, Clean-up and Maintenance Methods

A continuous inspection of construction methods and procedures would be performed by contractors to Colorado-Ute and Western. Colorado-Ute and Western would make a final inspection of the transmission line to ensure compliance with environmental regulations, guidelines, and stipulations.

All waste and scrap materials would be removed from the ROW and deposited in local landfills in conformance with local regulations and in accordance with land management agency or landowner agreement. Any damage to any property, bridges, fences, culverts, driveways, roadways, etc. incurred during construction would be repaired by the construction contractor.

Land disturbed by construction operations would be regraded, if necessary, and then provided with a vegetative cover as

recommended by the SCS, the appropriate land manager, or the landowner. Native vegetation, particularly that of value to wildlife which does not pose a hazard to the transmission line, would be allowed to grow on the ROW. Access roads would be designed and graded to minimize soil erosion and, if the road is to be removed, to permit revegetation.

Aerial maintenance inspection of the line would occur two to three times per year, with ground inspection occurring one to two times per year. Inspection intervals would be established so that routine maintenance would occur when the ground is firm, dry, or frozen. Aerial and ground maintenance inspection of the line would include observations of soil erosion problems, fallen timber, and conditions of the vegetation that require attention, as well as conditions of the conductors, support structures, and other features associated with the mechanical and electrical function of the line. If maintenance needs require access to a structure, the appropriate landowner would be notified as established in the easement arrangements.

3.2.5 Access Road Construction

The construction of access roads is required to allow for the movement of the various sizes and types of vehicles during construction and maintenance of the line. Access roads are nonpaved construction and maintenance roads along the ROW, permitting access and egress of personnel and materials to the ROW. New access roads with a steep grade are generally bladed with a track-type tractor, with all vegetation removed to allow for leveling and smoothing of the roadway. Where there is a flat grade, blading of the soil may not be necessary. Without such access, variable terrain conditions would generally require a longer overland access into and along the ROW.

The width of new access roads would normally be 4 m (14 feet). Roads with a grade of less than 7-10 percent are desired for safe construction. Specific standards for access roads would be developed in consultation with land management agencies and landowners. Existing roads are used, when possible, for construction access; however, if they are private, permission for their use would be obtained.

Where necessary, roadside drainage ditches and water bars would be installed to control erosion in accordance with the Guide for Controlling Sediment from Secondary Logging Roads (USDA). Where fences are encountered crossing the route, gates would be installed and locked if required.

Cattleguards would be installed where required in areas of range use. Gates would be installed and locked if requested by landowners or land managers.

The total amount of new access roads required to construct the facilities cannot be precisely determined until completion of centerline surveys, final alignment and structure siting. It is estimated one mile of access road would be required to construct one mile of transmission line. In areas of difficult or steep terrain it may be necessary to acquire ROW for access roads off the transmission line ROW to provide continuous access to individual towers or ingress and egress to the public road system.

3.2.6 Costs

The proposed project would cost approximately $121,000,000. In Table 3-1a the estimated costs for each participant of the project are shown. These costs are expressed in 1982 dollars and do not include interest during construction.

3.2.7 Schedule

The proposed construction is expected to start in 1984 with a planned completion date of 1986.

3.3 Alternatives That Were Considered and Eliminated

3.3.1 Energy Conservation and Load Management

REA urges its distribution borrowers to develop and promote energy conservation programs as defined in the Energy Conservation Handbook, a supplement to REA Bulletin 20-2, which was distributed to all REA distribution borrowers on January 31, 1979. For continued REA financing assistance, REA requires that: 1) a borrower is committed to energy conservation, 2) measures are planned or underway to conserve energy in borrowers facilities, and 3) an information and technical assistance program is planned or underway to help consumers conserve energy.

Colorado-Ute, Western and PSC encourage energy conservation to help reduce the need for additional generating capacity. The project participants and member cooperatives have studied and encourage energy conservation techniques and reduction of peak loads via methods, such as off-peak use of home appliances, proper home insulation, and energy conservation rates. Energy conservation efforts also include home audits, radio and television advertisements, lectures and seminars on recommended insulation practices, and the hiring of staff energy conservationists to inform customers of conservation practices.

REA recognizes that energy conservation and load management techniques can help to reduce present loads or redistribute peak

Table 3-1a

ESTIMATED COSTS FOR
RIFLE-SAN JUAN 345-KV
TRANSMISSION LINE PROJECT

PROPOSED PLAN
($1,000's -- 1982, NON-ESCALATED)

Substations	Colorado-Ute	Public Service Company of Co.	Western	TOTAL
Rifle 345-kv Substation	$650	$430	$650	$1,730
Grand Junction 345/230-kv Substation	1,010	1,450	1,010	3,470
Montrose 345/115-kv Substation	5,290	-0-	1,870	7,160
Lost Canyon 345/115-kv Substation	2,210	-0-	-0-	2,210
Long Hollow 345/115-kv Substation	6,110	-0-	-0-	6,110
*Shiprock 345/230-kv Substation	1,160	-0-	3,890	5,050
*Four Corners 345-kv Switchyard	580	-0-	580	1,160
Durango 115-kv Substation	100	-0-	-0-	100
Substation Total	$17,110	$1,880	$8,000	$26,990
Transmission Lines				
Rifle-Grand Junction 345-kv Single Circuit	6,675	4,450	6,675	17,800
Grand Junction-San Juan 345-kv Single Circuit	36,500	-0-	36,500	73,000
Shiprock-Four Corners *345-kv Single Circuit	1,154	-0-	1,154	2,308
Long Hollow-Durango 115-kv Single Circuit on Double Circuit Structures	1,000	-0-	-0-	1,000
Transmission Line Total	45,329	4,450	44,329	94,108
Project Total	$62,439	$6,330	$52,329	$121,098

*Facilities included in the Shiprock - Four Corners 230-kv Transmission Line Uprate Project has undergone NEPA review in an Environmental Assessment prepared by Western.

loads; however, conservation and load management cannot offset the demands of new growth in southwestern Colorado or meet the needs of additional transmission capacity in the area. Any benefits of conservation will not reduce electric power demand to a level which can obviate the need for the proposed transmission line. This alternative would avoid environmental impacts associated with constructing a transmission line; however, economic impacts could result from increased service outages and possible limitations on area growth. Conservation and load management should be considered a supplement to, but not an alternative to, the proposed line.

3.3.2 Purchase of Required Power

Several new generating facilities are being constructed or being planned for states immediately adjacent to Colorado. Surplus generating capacity may be available for long-term purchase from these facilities; however, the bulk transmission system to reliably and adequately transmit power to the load centers in southwestern Colorado is not available.

Purchased power would not satisfy the need for bulk transmission facilities to connect existing and future generating facilities and to provide for a better interconnected system and regional integrated system operation to effectively serve the loads. The environmental impact of purchasing power would be similar to the proposed project since an adequate transmission system would still have to be constructed. Therefore, the purchase of power is not a viable long-term alternative that would significantly reduce the need for additional transmission line capacity.

3.3.3. Noncentralized Generation Facilities

Construction of new noncentralized generation facilities could satisfy the need for emergency, maintenance, and other power requirements of Colorado-Ute's and PSC's systems. Localized generation might also help Western; however, it would not meet the transmission needs of expanded generation facilities or solve the reliability problems that currently exist. Localized generating stations would not be practical, efficient, or economical for Colorado-Ute, Western, or PSC. Colorado-Ute member loads have a relatively high load factor and, therefore, generation needed to serve these loads must be of base-load character, in contrast to peaking units. Energy sources such as solar, wind, or biomass are not presently capable of serving large load centers, particularly in a base-load role. Oil or gas-fired thermal units are not a viable option, particularly for base-load operation, because of fuel cost and fuel transportation problems. In addition, the Power Plant and Industrial Fuel Use Act of 1978

prohibits the use of natural gas or oil as a primary energy source in new base-load electric generating stations. The available remaining sites for hydroelectric generating projects are energy limited and more suitable for peaking operations. Nuclear power developments are not suited to small scale load center applications because of the large size of commercially available reactors. The higher costs and inefficiencies of small coal-fired units relative to larger units make small noncentralized coal-fired units an impractical alternative.

The construction of small, localized generation units would also require long licensing, design, and construction lead times and would not be available until the late 1980's or early 1990's. Low head hydroelectric projects offer a possible source of additional generation capacity to serve as peaking units. These projects may postpone the need for future generation capacity; however, they will still require additional transmission capacity to distribute the power. The proposed project is needed now to serve southwestern Colorado load areas and increase system reliability. Generation facilities would cause greater environmental impacts to such resources as air and water quality and would still require some transmission lines to be constructed from these facilities to load centers. Relative to the proposed project, construction of new units would also be economically prohibitive on a cost-per-kilowatt-hour basis. Therefore, it was determined that this alternative would not meet the present needs of Colorado-Ute, Western and PSC.

3.3.4 Upgrading/Rebuilding Existing Transmission Facilities

Western Colorado is presently being served by Colorado-Ute's 138 and 115-kv transmission system extending from the Craig-Hayden area to Western's Shiprock Substation near Farmington, New Mexico. Western also operates a 230-kv transmission line extending from the Craig/Hayden area to its Shiprock Substation. In order to upgrade either line to 345-kv from Rifle south to New Mexico, they would have to be taken out of service for extended periods of time. Both lines from Rifle south are fully loaded at this time making this an impractical alternative. In addition, if Colorado-Ute's 115-kv line were upgraded, new 115-kv transmission lines would be required for subtransmission (transmitting power and energy from proposed 345-kv substations, i.e., Montrose, Long Hollow to Colorado-Ute or Member Substations i.e., Nucla, Empire) of power and energy.

PSC's loads in the Grand Junction area are presently being served by the Rifle-Cameo 230-kv transmission line. It is not possible to uprate this line to 345-kv operation because there is no existing line of equal or greater capacity to provide an adequate

power source to the Grand Junction area during the construction required for uprating. Due to the design and age of the existing line, an uprate would require major structural modifications and replacement of the conductor which requires an extended outage period. PSC intends to use the existing 230-kv line as a subtransmission line to serve loads in the Colorado River Valley between Rifle and Grand Junction. This line will serve both PSC and Colorado-Ute loads. The environmental impact of several lines would likely be much greater than those impacts associated with a single transmission line. Therefore, upgrading existing transmission facilities is not considered a practical alternative.

3.3.5 Installation of Series Compensation

In order to increase existing transmission capacity in western Colorado, Colorado-Ute's 115-kv system and Western's 230-kv system could be series compensated to increase existing transmission capacity in western Colorado. This would involve the installation of capacitors, associated line terminals, and protective equipment at various sites throughout the system. The actual number and location of sites required would be dictated by final design criteria. Both transmission systems are presently fully loaded. The use of series compensation normally permits a higher line loading before limits due to voltage performance come into effect. However, transient stability considerations in western Colorado would limit considerably the gain in capacity obtained by installing the series capacitors. The higher loading would cause some sections of lines to approach the thermal rating of the conductor. Operation at higher load levels approaching thermal ratings causes a substantial increase of electrical energy loss on the line, resulting in less economical operation. In addition, series compensated lines create the potential for subsynchronous resonance (SSR) conditions. Effects of SSR include the possibility of damage to or loss of large turbine generators located near or connected to a series compensated line. Installation of capacitors would not provide enough additional capacity to serve loads in southwest Colorado; therefore, additional lines to transmit power to the load centers would also have to be constructed.

Series compensation would only serve as a short-term solution to meet the transmission requirements of the participants and only serve to postpone the environmental impacts associated with constructing a new transmission line. The loading limitation on the existing transmission system is dictated by the impact associated with outage of the 230-kv line. Therefore, even with a theoretical increase in capacity due to series compensation, no increase in line loading limits would result from this alternative.

Consequently, in the interest of providing and maintaining an economic and reliable electric transmission system, series compensation alternatives are not considered desirable for the Colorado-Ute, Western and PSC systems.

3.3.6 Transmission System Alternatives Proposed by Others

The transmission system additions proposed by Dr. K. R. Shah in his testimony before the Colorado Public Utilities Commission in 1981 consisted of the following:

1. Construct a 230-kv line from Cameo to Grand Junction and install a 230/115-kv transformer at Grand Junction.

2. Install a 230-kv switching station near Hotchkiss on the Rifle to Curecanti 230-kv line and construct a 230-kv transmission line to Delta and install a 230/115-kv transformer at Hotchkiss.

3. Either install series capacitors on the Western's 230-kv line from Curecanti to Shiprock or construct a 115-kv line from Lake City to Durango.

Colorado-Ute and PSC are presently interconnected at Grand Junction at 69 kv. Extending a radial 230-kv line from Cameo approximately 19.2 km (12 miles) to Grand Junction and installing a 230/115-kv transformer would provide additional support to Colorado-Ute's 115-kv system in the Grand Junction area. However, this plan would not address PSC's need for improved reliability and increased capacity for serving its Grand Junction area loads and would not address any of the needs of Western.

Western's Rifle-Curecanti-Shiprock 230-kv line is already loaded to its capacity. An increase in loading on this line due to the Hotchkiss-Delta 230-kv tap would reduce the capacity available for use by Western to meet its existing and future needs. A reduction of its capacity south of Rifle would not be acceptable to Western. This proposal simply places additional stress on the existing Western 230-kv system.

The Lake City to Durango 115-kv line would connect to Western's system at Blue Mesa. This would add to the load on the Western system south of Rifle and provide little relief for the overload conditions south of Curecanti. The length of the proposed 115-kv line, approximately 160 km (100 miles) from Blue Mesa, would limit the support supplied to the Durango area loads and would provide little support for loads west of Durango. The line would traverse extremely rugged terrain between Lake City and Silverton

reducing its dependability as a bulk power source due to limited access for maintenance during winter months and would make construction of the line difficult and expensive.

The Curecanti to Shiprock 230-kv line presently experiences high losses during heavy load conditions. The installation of series capacitors on the Curecanti-Shiprock 230-kv line would increase the loading on that line resulting in even higher line losses. Series capacitors would also create the potential for subsynchronous resonance (SSR) problems which could cause extensive generator damage (see Section 3.3.5).

The Curecanti-Shiprock 230-kv line is currently being operated at it's transient stability limit. Operation beyond this limit would create the potential for a major cascading of line outages throughout Colorado and Wyoming which would result in power outages to large areas of both states. Such operation is not consistent with the WSCC's Reliability Criteria for System Design. The transient stability limit would not be significantly increased by the series capacitors. For these reasons, series capacitors, along with the other system additions, are not considered a solution to the transmission system problems in western Colorado.

The environmental impacts of Dr. Shah's proposal would be similar in nature to the proposed project except the total line mileage would be less. The impacts of a Lake City-Silverton-Durango line would be significant because it would cross a highly scenic area and in proximity to several areas proposed for wilderness designation.

All these system additions would place an increased burden on the existing 230-kv and 115-kv facilities owned by Western and PSC. These additions would provide little or no benefits to Western and PSC and would only provide minimal short term relief to Colorado-Ute's need for additional transmission. This plan does not address the need for additional transmission capacity from a regional basis including coordinating the needs of all area utilities as was requested by the PUC staff. Therefore, this plan is not an acceptable alternative and would not meet the needs of all the participants.

3.3.7 Construction of a 500-kv or 765-kv Transmission Line

The proposed 345-kv system will meet the present and future load requirements of southwest Colorado and also allow Colorado-Ute, Western and PSC to interconnect with other area power suppliers. The participants do not propose to construct a 500-kv or 765-kv

line for the following reasons. Utilization of a higher voltage such as 500 kv or 765 kv is not economical, particularly considering the need for several substations to serve loads between Rifle and San Juan which would be very costly to construct for these higher voltages. The environmental impacts would be similar to the proposed project. The towers would have a greater visual impact, since they would be higher and the ROW wider. Support structures would require a greater base area and, therefore, a greater amount of land area would be disturbed. A higher voltage transmission line in western Colorado could not be loaded much above the capacity of a 345-kv transmission line, because the existing transmission system does not have sufficient capacity to support the outage of a 500-kv or 765-kv line.

3.3.8 Construction of a 400-kv Direct Current Transmission Line

A dc power transmission system is a possible alternative to an alternating current (ac) system. If a dc transmission system were to be constructed, converters - which change ac to dc - and inverters - which change dc to ac - would be required at each terminal or substation of the transmission line.

In general, a two-pole dc system is economically competitive when transmitting bulk power between points greater than 640 km (400 miles), the distance necessary for savings in line construction to offset the cost of terminal converter-inverter stations. The distance between Rifle and the San Juan Generating Station is approximately 440 km (275 miles), and has three intermediate load centers, each of which would require a converter-inverter station. The shorter than desirable line length and added converter-inverter stations required would result in prohibitive costs.

The environmental impacts would be similar to the proposed project. A dc system, therefore, cannot be economically justified and is not considered to be a viable alternative.

3.3.9 Construction of an Underground Transmission Line

Present technology for undergrounding high-voltage transmission lines requires the use of high pressure oil-filled pipe type cable in which the three-phase conductors are each wrapped with paper, covered with metal foil and skid wires, and pulled into a steel pipe. The pipe must be buried in the earth to a depth of 0.9 to 1.8 m (three to six feet), filled with insulating oil, and pressurized. Other requirements for undergrounding include installation of pumping stations to maintain the oil pressure and installation of shunt reactors to absorb the cable charging current.

Underground construction of the proposed transmission line would require one pumping and shunt reactor station approximately every 48 km (30 miles) of transmission line, or a total of seven stations between Rifle and San Juan.

Underground construction of the proposed transmission line would also require that the easement for the entire transmission line be cleared, trenched for cable installation, and backfilled. In the event of rupture of the high pressure oil-filled cable, oil could leak out into the ground and cause damage to surface animal and plant life. Repairs of such ruptures, while infrequent, would require extensive excavation and reprocessing of the cable system in order to place the system back in service. Joints for the oil filled pipe type cable account for a substantial portion of its cost. Highly skilled labor for this type of construction is at a premium. River crossings and cliffs require special installation for buried lines as compared to overhead aerial crossings. River beds must be trenched for the cable then backfilled to cover the cable. This requires some disturbance of river beds' soil deposits and aquatic life. Special cable installation would be required for traversing steep canyon walls and cliffs to provide for the additional internal pressure caused by the hydrostatic head of the oil, in addition to the normal pressure required for cable operation. Underground construction would also necessitate blasting to provide a trench through solid rock formations with accompanying disturbance to the local environment and possibly the general water hydrology. Underground transmission line construction has some environmental advantages over overhead lines. The visual impact of structures and conductors is minimized and the required ROW is reduced to about a third of that required for overhead lines. However, the increased cost, habitat disturbance, general environmental disturbance, and cable maintenance of underground construction would negate any possible benefits of an underground line.

The cost of underground construction for the proposed transmission line would be approximately ten times as great as for overhead construction. Due to of the economics and other reasons discussed above, underground construction is not considered to be a viable alternative for long distance transmission.

3.4. Project Alternatives That Increase Capacity And Reliability To Southwest Colorado.

3.4.1 Introduction

The practical method of increasing capacity for serving loads in southwestern Colorado is to construct new transmission facilities.

Transmission facility additions were considered as alternatives only if they actually provided new capacity into the southwestern Colorado load centers and improved the reliability of service to the area. Transmission plans, which required utilization of the existing capacity of Western's system were not considered as long term alternatives.

The Rifle Substation is the primary bulk source of power for western Colorado and the only bulk source at which there is adequate available capacity. Therefore, the transmission alternatives studied consisted of different transmission line plans connecting Rifle Substation with the Four Corners area. Table 3.2 is a cost summary of the transmission line alternatives which were considered. Table 3.2 shows the estimated costs for substations and transmission line facilities associated with each alternative. Alternatives using a voltage less than 345-kv would be terminated at Western's Shiprock Substation, approximately two miles west of San Juan Station, because lower voltage terminal facilities do not exist at the San Juan Generating Station Switchyard.

3.4.2. Rifle-Grand Junction, Single-Circuit 345 kv; Grand Junction-Shiprock, Single-Circuit 230-kv Transmission Line

This alternative represents a transmission system which would provide approximately 250 mw of transmission capacity south from Rifle into the Colorado-Ute member load centers. This alternative consists of a 345-kv single-circuit line from Rifle to Grand Junction with Colorado-Ute and PSC each having 50 percent participation. From Grand Junction, a single-circuit 230-kv line would be constructed south, following the same routing as the proposed plan and would terminate at Western's Shiprock Substation. Colorado-Ute would be the sole owner of this 230-kv line and it would be necessary for Western to also plan and construct an additional transmission line south from its Rifle Substation to the Shiprock Substation most likely using one of the alternative corridors.

An advantage of this plan would be somewhat smaller towers and a narrower ROW between Grand Junction and San Juan than the proposed plan. Disadvantages include higher costs for Colorado-Ute and PSC and no provision for meeting the capacity needs of Western. Transmission line losses would be higher for the 230-kv section of this alternative. Although the 230-kv interconnection at Shiprock provided by this alternative would significantly improve the reliability of service to southwestern Colorado, it would not be as strong an interconnection as the proposed plan.

Table 3-2
WESTERN COLORADO TRANSMISSION SYSTEM
COST COMPARISON OF
TRANSMISSION LINE ALTERNATIVES

ESTIMATED COSTS
($1,000's -- 1982)

	Colorado-Ute			Public Service Co. of Colorado			Western			Total Project		
	Substations	Lines	Total	Substation	Lines	Total	Substation	Lines	Total	Substation	Lines	Total
Proposed Plan	17,010	45,329	62,339	1,880	4,400	6,330	8,000	44,329	52,329	26,890	94,108	120,998
Alternatives												
Alternative 3.4.2.	16,112	54,370	70,482	3,838	8,900	12,738	--	--	--	19,950	63,270	83,220
Alternative 3.4.3.	14,054	49,349	63,403	2,110	4,450	6,560	8,486	48,349	56,835	24,650	102,148	126,798
Alternative 3.4.4.	13,069	56,054	69,123	--	--	--	--	--	--	13,069	56,054	69,123
Alternative 3.4.5.	7,654	84,654	92,308	--	--	--	--	--	--	7,654	84,654	92,308
Alternative 3.4.6.	18,840	50,094	68,934	2,690	7,630	10,320	9,605	49,094	58,699	31,135	106,818	137,953
Alternative 3.4.7.										43,435	162,720	208,155

Alternative 3.4.2. -- Rifle-Grand Junction, single circuit 345 kv; Grand Junction-Shiprock, single circuit 230 kv.

Alternative 3.4.3. -- Rifle-Grand Junction, single circuit 345 kv; Grand Junction-Shiprock, double circuit 230 kv.

Alternative 3.4.4. -- Rifle-Shiprock, single circuit 230 kv.

Alternative 3.4.5. -- Rifle-Shiprock, 2 single circuit 115 kv.

Alternative 3.4.6. -- Rifle-Grand Junction, double circuit 345 kv; Grand Junction-Shiprock single 345 kv.

Alternative 3.4.7. -- Rifle-Shiprock, double circuit 345 kv.

3.4.3. Rifle-Grand Junction, Single-Circuit 345 kv; Grand Junction-Shiprock, Double-Circuit 230-kv Transmission Line

This alternative is a variation of the previous alternative and consists of a 345-kv line from Rifle to Grand Junction but would have a double circuit 230-kv line from Grand Junction to Shiprock. In this plan Colorado-Ute, Western and PSC share the Rifle-Grand Junction capacity on a 37.5, 37.5, and 25 percent basis, respectively. This configuration provides approximately 500 mw of capacity from Grand Junction to Shiprock in the 230-kv double-circuit transmission line. This 230-kv double-circuit line would be shared equally between Western and Colorado-Ute. This alternative is very similar to the proposed plan but utilizes 230-kv double-circuit construction in lieu of 345-kv single-circuit construction south of Grand Junction. All three participants' needs are satisfied.

The advantage of this plan is increased reliability due to the two 230-kv circuits between Grand Junction and Shiprock. Disadvantages include larger towers, higher costs for all participants and higher transmission line losses than a single circuit 345-kv line.

3.4.4. Rifle-Shiprock, Single-Circuit 230-kv Transmission Line

This transmission alternative consists of a single-circuit 230-kv line south from Rifle to Shiprock. This alternative provides approximately 250 mw of capacity to serve Colorado-Ute's member loads. The facilities would be constructed solely by Colorado-Ute. If this alternative were chosen, it would be necessary for Western to plan and construct its own transmission system between Rifle and Shiprock, and for PSC to plan and construct its own transmission system between Rifle and Grand Junction. These additional facilities would likely use one of the alternative corridors.

Disadvantages of this plan include higher costs for Colorado-Ute, higher transmission line losses and reduced interconnection capability at Shiprock. The primary advantage would be smaller towers and narrower ROW.

3.4.5. Rifle-Shiprock, 2 Single-Circuit 115-kv Transmission Lines

This alternative consists of two additional 115-kv circuits between Rifle and Shiprock. The 115-kv circuits would be placed on double-circuit towers to provide for future capacity additions and minimize overall environmental impacts. This plan would only provide approximately 125 mw of new capacity initially for serving Colorado-Ute member loads (ultimately 250 mw of capacity in four circuits) and would be constructed solely by Colorado-Ute.

Colorado-Ute would be the sole owner of the 115-kv circuits and it would be necessary for Western to construct its own transmission system between Rifle and Shiprock, and for PSC to construct its own system between Rifle and Grand Junction. These added facilities would likely also use one of the alternative corridors.

Disadvantages of this alternative are, again, higher costs for Colorado-Ute, higher transmission line losses and reduced interconnection capability. This alternative also does not initially provide transmission capacity equivalent to the proposed plan. There would be some increase in reliability of service due to the multiple 115-kv circuits. Towers would be smaller and ROW narrower.

3.4.6 Rifle-Grand Junction Double-Circuit 345 kv; Grand Junction-San Juan Single 345-kv Transmission Line

This alternative is similar to the proposed project except that there is an additional 500 mw of capacity between Rifle and Grand Junction. This alternative advances the timing of a second circuit and places it in service before it is needed, resulting in an increased initial cost for the Project. Based on current load projections, there is presently no need for the additional capacity to this area.

The disadvantages of this plan include higher initial costs for the participants, excess capacity available between Rifle and Grand Junction, and larger towers in this northern section.

3.4.7 Rifle-San Juan Double-Circuit 345-kv Transmission Line (Original Proposal)

Colorado-Ute and Western previously proposed to build a double circuit 345-kv transmission line from Rifle, Colorado to the San Juan Generating Station near Farmington, New Mexico. This original proposal was routed to North Fork (Paonia), to Delta, to Montrose, to Norwood, to Durango (Hesperus) and to then San Juan Generating Station. Associated substations were to be located at Rifle, North Fork, Delta, Montrose, Norwood, Lost Canyon, Hesperus, the San Juan Generating Station and Shiprock. Colorado-Ute was to own 70 percent of the capacity and Western was to own the remaining 30 percent. On Feburary 5, 1982, the PUC issued a decision denying Colorado-Ute's application for a Certificate of Public Convenience and Necessity. Since that time new growth in southwestern Colorado has decreased. Therefore, this alternative is no longer a viable alternative. Although this plan is a system alternative to the proposed project, it is no longer considered a viable project because of high initial cost, decreased needs and denial of the Certificate by the PUC.

3.4.8 Rifle-San Juan Single-Circuit 345-kv Transmission Line (Proposed Project)

This alternative consists of a single circuit 345-kv transmission line south from Rifle to the San Juan Generating Station. This alternative provides approximately 500 mw of capacity shared jointly by Colorado-Ute, Western and PSC. PSC would only participate between Rifle and Grand Junction. This alternative would serve the needs of all three participants. Western and PSC would not have to construct separate facilities. The advantages of this proposal are that it is cost effective for each of the participants, it meets each of the participants' needs, it postpones the construction of additional facilities by Western and PSC and it decreases system losses.

3.4.9 System Alternative Comparisons

A comparison of each of the alternatives with the proposed 345-kv transmission plan indicates that there is no identifiable financial advantage in choosing any of the alternatives (Table 3-2). Transmission line losses could be expected to be greater for the various alternatives than for the proposed plan. From an environmental standpoint, it is problematical whether Colorado-Ute, Western, and PSC would be able to act independently to obtain multiple ROW across private and public lands. This is because the overall environmental impact resulting from independent action would undoubtedly be greater than for the jointly proposed 345-kv transmission plan. Further, if in the future, Western uprates its Rifle-Shiprock 230-kv line for 345-kv operation, it is estimated that the power transfer capability of the proposed Rifle-San Juan 345-kv line will be somewhat greater than the 230-kv double-circuit alternative.

In summary, the construction of the proposed 345-kv transmission line plan is in the public interest as well as in the best interests of the project participants. As electric loads continue to increase in western Colorado, this coordinated 345-kv transmission plan, in the long-term, will remain cost effective as additional facilities are needed, and will avoid the excessive environmental impact associated with a proliferation of lower voltage transmission lines.

3.5 No Action

The alternative of taking no action, thus not constructing the proposed transmission facilities would limit transmission capacity in the southwestern Colorado area to its present level. Taking no action, while not impacting the environment, would compound the power supply and reliability problems in the area.

Colorado-Ute and PSC are legally obligated to provide an adequate and reliable supply of electric power and energy to their consumers. Taking no action would be contrary to this obligation. Included among the potential consequences that could result are: 1) reduced system reliability resulting from insufficient transmission system facilities to withstand power flows under loss of major system elements or other conditions; 2) increased power system losses and reduced efficiency by loading facilities beyond optimal ratings; 3) inability to maintain system voltage levels consistent with transmission system equipment design; and 4) localized and widespread load curtailment.

If new transmission facilities are not built to meet both existing system needs and future requirements, the environmental impacts described in Section 5.0 would not occur. However, nonconstruction would also result in the increased risk of power failures in the southwestern Colorado area. Power failure would have an adverse impact on residential, agriculture and commercial users, as well as the health and welfare of the public. Area growth would also be limited if additional power is not made available when needed. The implementation of the no action alternative could result in serious capacity shortages and reliability problems in southwestern Colorado. Simply maintaining the present system would not permit the project sponsors to effectively provide for the existing and projected long range energy needs of their customers. If the project were not constructed, Western and PSC would have to construct separate facilities to meet their individual needs. Environmental impacts to the area would be increased.

3.6 Alternatives Within the Proposed Action

3.6.1 Selection of Study Area and Corridors

The study area for the proposed project is approximately 160 km (100 miles) wide and 322 km (200 miles) long and determined by the designated end points: Colorado-Ute's Rifle Substation in Garfield County, Colorado, and the San Juan Generating Station in San Juan County, New Mexico. The study area is bounded on the west by the Colorado-Utah state line and on the east by a north-south line defined by the eastern boundaries of Mesa, Ouray, San Juan, and La Plata Counties (see Figure 3-4).

After the study area was identified, a constraint mapping process was utilized to identify potential environmental constraints to corridor siting. Potential constraints included such criteria as National Park Service monuments and parks, existing and proposed wilderness areas, reservoir projects, existing and proposed wild and scenic river segments, known cultural resources, cities and

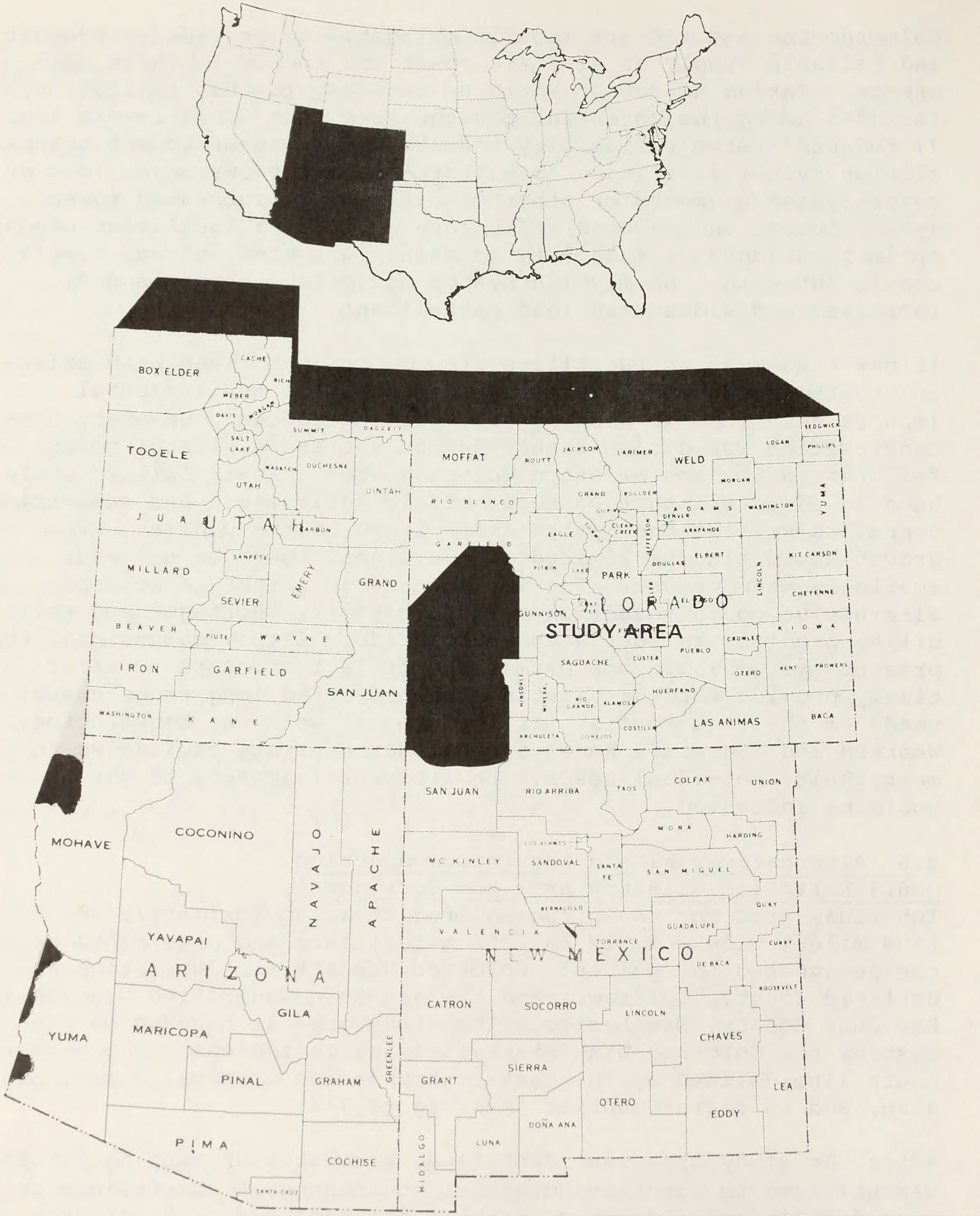


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Figure 3-4
LOCATION OF
STUDY AREA

COLUTE 78-069-4-001 ENV. ANAL., RIFLE-SAN JUAN TRANS. LINE

towns, airports and presence of federally listed threatened and endangered species. In addition, federal, state, and local agency and public input through an interagency meeting and several public scoping meetings was sought early in the process to identify constraint areas and potential corridors. Many meetings regarding the project have been held in the study area from 1979 to the present time (see Section 6 and Appendix G). After load centers were identified, corridors were chosen to connect the load centers by avoiding known environmental constraints. Existing utility corridors were evaluated for additional use, whenever possible, in accordance with the Federal Land Management Policy Act and to minimize the potential environmental impact of the project.

Since the original proposal, several corridor segments were deleted from further evaluation and new corridor segments were identified as a result of input from federal, state and local agencies. The participation of PSC in the project has eliminated the need to evaluate corridors through the North Fork Valley area because PSC's loads are located in the Grand Junction area. Use of corridors in the North Fork area would necessitate building additional lines to the Grand Junction area. Corridors in the Grand Junction area were identified and added as a result of the revised project.

3.6.2. Substation Site Selection

Additional substation capacity is needed to serve load centers in southwestern Colorado near Grand Junction, Montrose, Lost Canyon (Cortez), and Durango. The Norwood area was also identified as a possible future substation site as may be required by load and system conditions.

Criteria for location and selection of substation sites included:

1) Proximity to load areas and associated planned electrical connection facilities
2) Proximity to proposed transmission corridors
3) Adequate access for substation equipment delivery
4) Suitability of terrain
5) Availability of land
6) Environmental factors including:
   a. Avoidance of existing and planned residential or industrial developments
   b. Avoidance of floodplains and proposed water storage projects
   c. Avoidance of irrigated and prime farmland
   d. Minimization of visual intrusion

Information on the proposed substation sites are presented in Table 3-3.

3.6.2.1 Rifle Substation

The Rifle Substation is an existing substation located in Garfield County. This substation will require the addition of terminal facilities within the fenced security area of the substation.

3.6.2.2 Grand Junction Substation

The primary purpose of the proposed Grand Juction 345/230-kv Substation is to deliver PSC power into the Grand Junction area.

PSC loads in the Grand Junction area were approximately 100 mw in 1982. A substation in the Grand Junction area is necessary in order to support this major load center. This substation is an integral part of PSC's basis for participation in the Rifle-Grand Junction section of the Project.

Alternative locations for the new Grand Junction Substation facilities include two existing substation sites, the Colorado-Ute Grand Junction Substation and the PSC Cameo Substation, and a new substation site located on a plateau south of the Cameo Substation (see Figure 3-5).

The Colorado-Ute Grand Junction Substation is an existing substation near the load center which can be easily expanded on undeveloped and uncultivated land. Subtransmission and distribution lines are presently connected into the substation. The existing site is conveniently located to connect the Rifle-San Juan line with minimal environmental impact and lowest cost.

PSC's Cameo Substation is located by the Cameo Generating Station. It is located in a narrow canyon and is visible from Interstate 70. The existing substation has limited space for expansion.

The substation site on a plateau south of Cameo Station is an undeveloped site where an entirely new substation could be constructed. It would be close to Cameo Station and although its development would limit the addition of lines and facilities at the Cameo Substation, it offers no advantage over the expansion of the existing Grand Junction Substation. The disadvantages are that transmission lines would have to be routed to this new substation and connections would have to be made between this substation, the existing Grand Junction Substation and the Cameo Substation. This would result in three substations in the area rather than two.

TABLE 3-3 - PREFERRED SUBSTATION LOCATIONS

Substation	County	Legal Description	Segment	Status	Approx. Total Area (ha/acre)	Approx. Total Area To Be Disturbed (ha/acre)	Vegetative Type	Access Needed	Tap Lines Needed	Construction
Rifle	Garfield	SE1/4 NE1/4 SW1/4 of Sec.14 and NE1/4 SE1/4 SW1/4 of Sec. 14, T6S, R93W, 6th Principal Meridian.	Northern Terminus	Existing	32/80	None	Mountain Shrub	Existing	None	Termination Facilities only
Grand Junction	Mesa	NE1/4 NW1/4, Sec.30, T1S, R2E of the Ute Meridian	5a	Existing	16/40	5/12	Saltbush and Greasewood	Existing	None	Expansion
Montrose (Switching)	Montrose	19 acres located in the SE1/4 SE1/4 Sec.3, T48N, R10W, NMPM	14b	Existing	18/46	3/8	Pinon-Juniper	Existing	None	Expansion
Long Hollow	La Plata	E1/2 SW1/4, SW1/4 SW1/4 Sec.14 and SE1/4 SE1/4 Sec.15, all T34N, R11W, NMPM	32b	New	4/10	4/10	Mountain Shub	Adjacent to Country Road	115-kv line to Durango Substation	New Construction
Durango	La Plata	Five acres located in the southwest corner of Sec.31, T341/2N, R9W, NMPM	--	Existing	2/5	0.2/0.5	Pinon-Juniper	Existing	115-kv line to Long Hollow Substation	Expansion
San Juan Station	San Juan (New Mexico)	NW1/4 SE1/4 NW1/4, Sec.20, T30N, R15W, NMPM	Southern Terminus	Existing	4/10	None	Sagebrush/ Grassland	Existing	None	Termination Facilities only
FUTURE SUBSTATIONS										
Lost Canyon	Montezuma	NE1/4 NE1/4, Sec.35 and E1/2 SE1/4, Sec.26 all T37N, R15W, NMPM	30c	Existing	48/120	None	Mountain Shrub	Existing	See Section 3.7.2.4	Expansion
Norwood	San Miguel		--	New				--	--	New

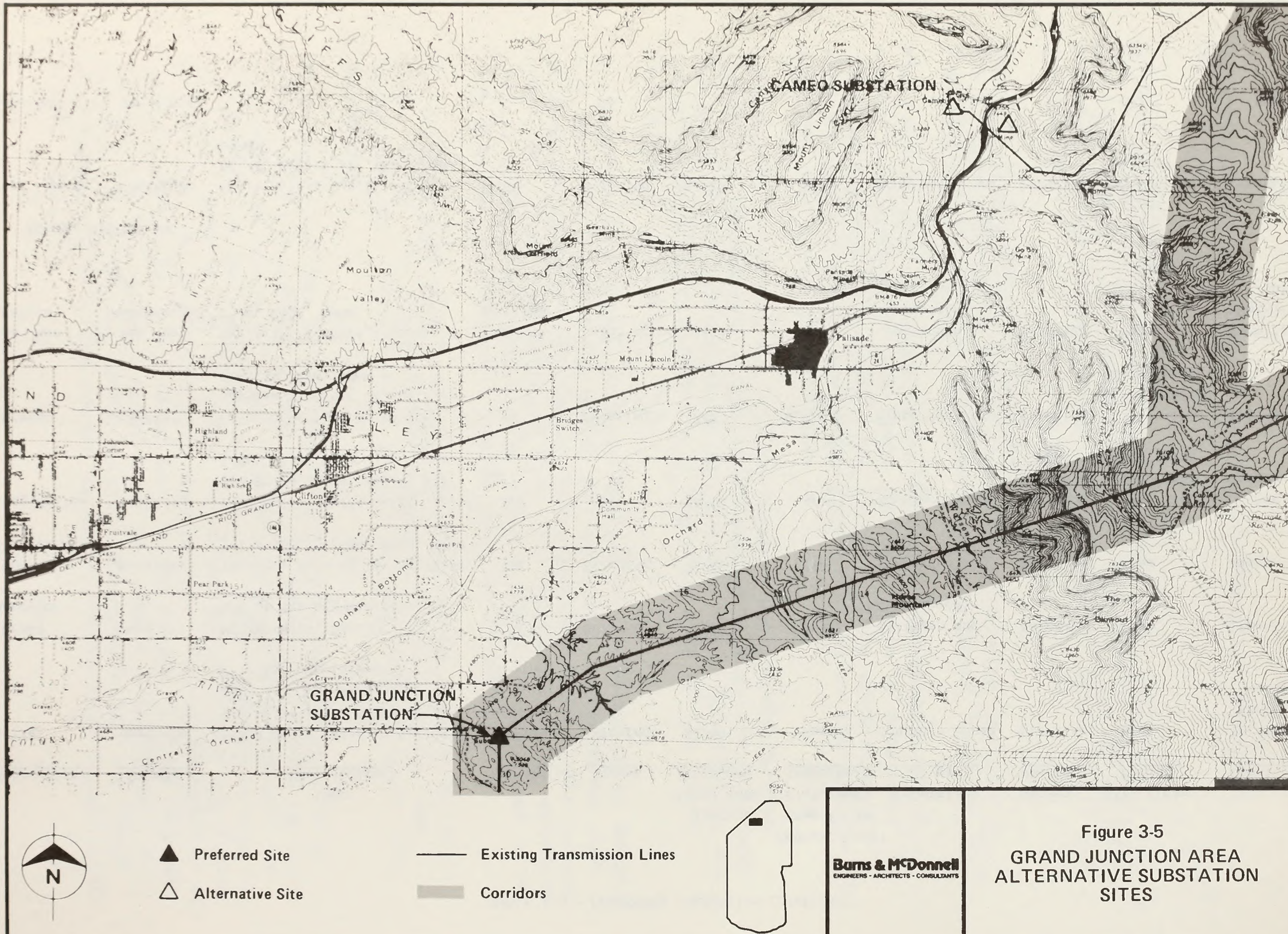

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Figure 3-5
GRAND JUNCTION AREA
ALTERNATIVE SUBSTATION
SITES

The Grand Junction Substation is proposed as the preferred site because it is in close proximity of the proposed line, it has adequate access and space for expansion, it has existing subtransmission and distribution lines, it would have minimal environmental impact and it would have the lowest cost.

3.6.2.3 Montrose Substation

The proposed Montrose Substation would be located at the existing Montrose 115-kv Switching Station in Montrose County. The existing site meets the substation selection criteria. The substation site would have to be expanded by approximately 3 hectares (8 acres). The site has existing access and would require no new tap lines.

The Montrose Substation is necessary to deliver bulk power to the Delta-Montrose Electric Association load center in the Montrose area. Five major 115-kv lines are presently terminated at this existing Montrose Switchyard. Alternative substation sites on any of these 115-kv lines, although possible, would not be preferred. A new site would have to be developed and capacity to deliver power into the 115-kv system at the Montrose Switchyard would have to be constructed.

3.6.2.4 Norwood Substation (Future)

The Norwood Substation site is addressed in this analysis as a future substation site. A substation in the Norwood area is not required initially but is expected to be needed in the future. The timing of substation construction at Norwood will depend upon load growth in the area. Significant load growth in the Telluride area is expected to require the construction of a 115-kv line from Nucla to Telluride. A Norwood Substation would be strategically located between the Nucla and Telluride load centers and would support both areas without the need for two major substations. Such a location would also provide emergency support to the Montrose and Lost Canyon areas in the event of an outage at either of these substations.

In the event that the construction of this substation becomes necessary, it will be the subject of a separate NEPA review perhaps using the tiering process provided for in the CEQ Regulations.

3.6.2.5 Lost Canyon Substation (Future)

The Lost Canyon Substation is an existing substation located in Montezuma County. This area is already a significant load center encompassing the city of Cortez. The existing Lost Canyon 230/115-kv Substation is presently heavily loaded and provides

important support to the Cortez and Durango areas. Construction of the proposed Long Hollow Substation would reduce loading on the existing Lost Canyon Substation. However, loads in the Lost Canyon area are expected to increase substantially within the next five years due in large part to the CO_2 development in the area. Additional support of the 115-kv system in this area will be needed as the load develops. There are presently three major 115-kv lines terminated at Lost Canyon with a fourth 115-kv line to be constructed in 1983. Location of the Lost Canyon 345/115-kv substation at other than the existing site is not preferred for reasons similar to those for the Montrose Substation. A new site would have to be developed increasing cost and environmental effects, and decreasing the 115-kv capacity available to deliver power from the 345-kv substation. The existing substation will not require site expansion or construction of new access roads.

3.6.2.6. Long Hollow Substation

The Long Hollow Substation will serve the La Plata Electric Association loads in the Durango area and provide transmission support for the Lost Canyon, Cortez and Cahone areas. This substation, along with the proposed 115-kv transmission line, will also increase system reliability by providing another source of power into the Durango area.

The Long Hollow 345-kv Substation is proposed to be constructed on property owned by Colorado-Ute appproximately 11 km (7 miles) west of the Durango Substation. A new substation site is proposed rather than routing the 345-kv line to the existing Durango Substation site and expanding the existing substation there. This plan is being proposed because of the limitations in expanding the existing substation into a large 345-kv substation; and the costs and environmental impacts associated with routing the proposed 345-kv line to and from the Durango Substation site.

Three alternative electric systems to connect the Long Hollow 345-kv Substation to the existing 115-kv system were investigated in addition to the proposed 115-kv connection from the Long Hollow Substation to the Durango Substation. These alternatives were: (1) constructing a double- circuit 115-kv line north from Long Hollow and connecting it to the Lost Canyon-Durango 115-kv line; (2) connecting the DurangoShiprock 115-kv line into the Long Hollow Substation; (3) constructing a double-circuit 345-kv tap line to the existing Durango Substation site and constructing a 345/115-kv substation at the Durango site.

Alternative (1) if it followed the proposed 345-kv line corridor (Segment 32c) from the Lost Canyon-Durango 115-kv line to the

Long Hollow Substation, would be approximately 18 km (11 miles) long. A more direct route to the Lost Canyon-Durango 115-kv line (Segment 32b) would be 13 km (8 miles) long, but would cross 10 km (6 miles) of high density human settlement (see Figure 4-29) and would be a difficult route on which to obtain approvals.

Connecting the existing Durango-Shiprock 115-kv line into the Long Hollow Substation [Alternative (2)] would result in extremely heavy loading on the Long Hollow-Shiprock 115-kv line for certain outage conditions on the 345-kv line. This could have adverse affects upon the transfer capability of the system south of Rifle and reduce operating flexibility. The existing Durango-Shiprock 115-kv line is an important power source for supporting the Durango area. Connecting this line into the Long Hollow Substation would provide support under normal conditions similar to the proposed system, but it would be less reliable than the proposed plan, since a new additional power source into the Durango Substation would not be provided.

Construction of a double-circuit 345-kv tap line into the existing Durango Substation site [Alternative (3)] is less desirable than the proposed plan from both a cost and environmental impact perspective. Construction of a 345-kv substation at the Durango site would require expansion to the south onto BLM land and relocation of a county road due to physical limitations in expanding this site.

The Long Hollow site was selected because of its proximity to the Durango Substation and because the existing Durango-Shiprock 115-kv line was located on this property and could easily be connected when required into the new substation. A comparison of eight alternative substation sites that are in close proximity to the Durango Substation is presented in Table 3-4. The alternative sites are located on Figure 3-6.

3.6.2.7. Durango Substation

The existing Durango Substation located in La Plata County, will be expanded by approximately 0.2 ha (0.5 acres). The physical limitation stated above would not interfere with this small expansion. A 115-kv bay and terminal facilities would be added to the substation.

3.6.2.8. San Juan Generating Station Switchyard

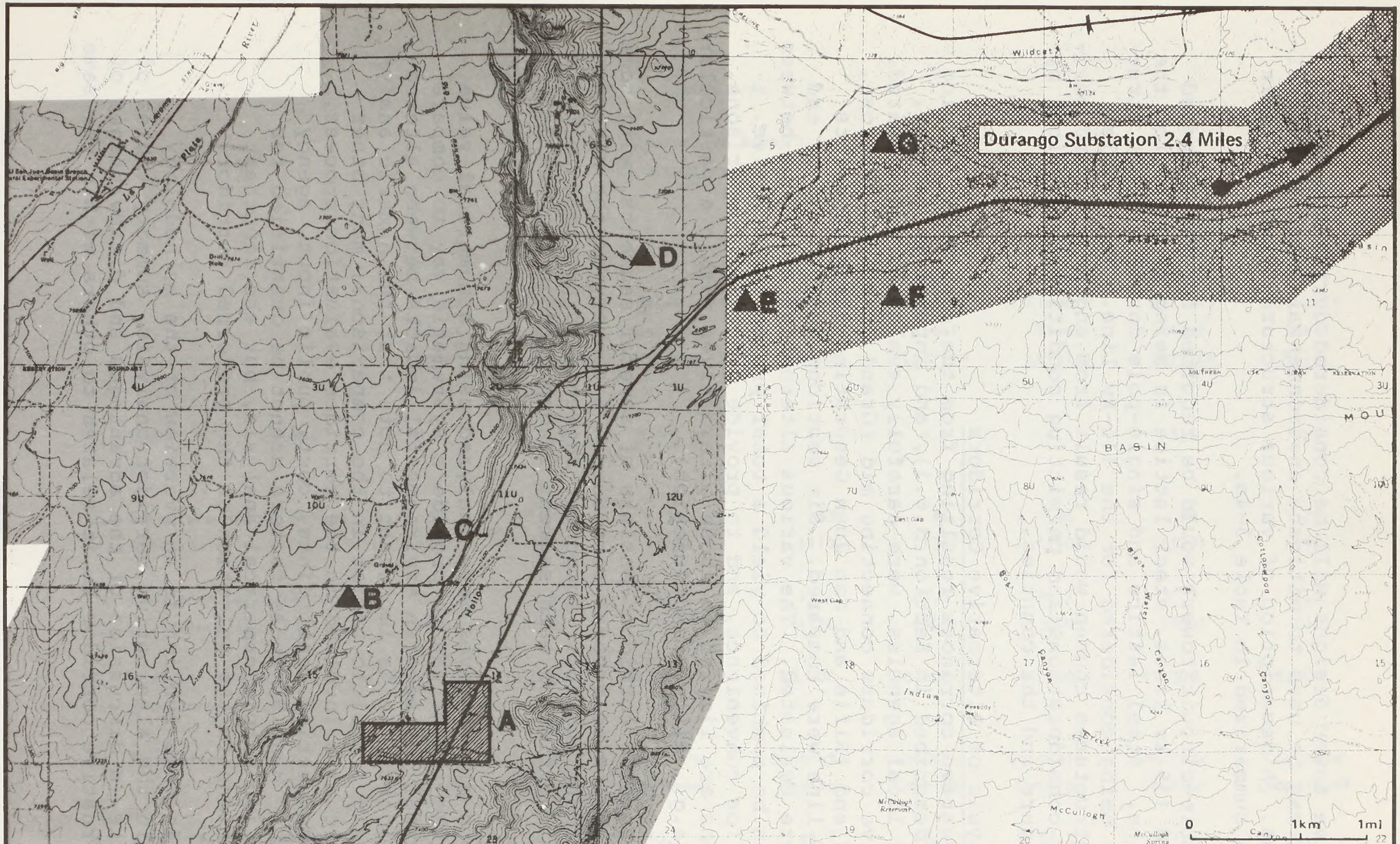
The southern terminus of the proposed line would be Public Service Company of New Mexico's existing switchyard at the San Juan generating station in San Juan County, New Mexico. Termination facilities would be added to the existing yard. The existing facility does not need to be expanded.

3.6.3 Alternative Tower Designs

The proposed 345-kv transmission line would utilize steel lattice as the standard support structure (see Figures 3-1 and 3-2).

Table 3-4 Comparison of Long Hollow Alternative Substation Sites

	Long Hollow Alternative A	Alternative B	Alternative C	Alternative D	Alternative E	Alternative F	Alternative G	Durango (Existing Substation) Alternative H
Proximity to load centers & associated 115-kv facilities	Shiprock-Durango 115-kv line is located on the property	Approximately 1 mile west of Shiprock-Durango 115-kv line	Approximately 1/2 mile west of Shiprock-Durango 115-kv line	Approximately 1/2 mile from Shiprock-Durango 115-kv line	Adjacent to Shiprock-Durango 115-kv line	<1/2 mile from Shiprock-Durango 115-kv line	Approximately 1/2 mile from Shiprock-Durango 115-kv line	Existing Substation serving La Plata Electric Association loads is located on site
Proximity to proposed transmission corridors	Within corridor being evaluated	Within corridor being evaluated	Within corridor being evaluated	Within corridor being evaluated	Just outside corridor being evaluated	Approximately 1 mile from corridor being evaluated	Approximately 1 mile from corridor being evaluated	Approximately 5 miles from corridors being evaluated
Adequate access for equipment delivery	Existing roads in close proximity	Existing roads in close proximity	Existing roads in close proximity	Existing roads in close proximity	Existing roads in close proximity	Existing roads in close proximity	Existing roads in close proximity	Existing roads in close proximity
Suitability of terrain for substation	Suitable	Suitable	Suitable	Suitable	Suitable	Suitable	Suitable	Physical limitations would require relocating county road and expanding onto BLM land
Availability of Land	Land was purchased	Unknown No attempt to purchase	Unknown No attempt to purchase	Unknown No attempt to purchase	Unknown No attempt to purchase	Unknown No attempt to purchase	Unknown No attempt to purchase	Land available adjacent to substation
Avoidance of existing and planned residential or industrial developments	Avoids planned developments	Avoids planned developments	Avoids planned developments	Planned developments nearby	Avoids planned developments	Avoids planned developments	Planned developments nearby	Avoids planned developments
Avoidance of floodplains and proposed water storage projects	Avoids	Avoids	Avoids	Avoids	Avoids	Avoids	Avoids	Avoids
Avoidance of cultivated land	Avoids cultivated lands	Cultivated lands may be impacted	Avoids cultivated lands	Avoids cultivated lands	Avoids cultivated lands	Avoids cultivated lands	Avoids cultivated lands	Avoids cultivated lands



N

Preferred Site

Alternative Site

Existing 115-kV Transmission Line

345-kV Corridors

115-kV Corridor

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Figure 3-6
LONG HOLLOW ALTERNATIVE SUBSTATION SITES

Alternative tower designs will be considered during the design phase and may be used to mitigate environmental impacts in sensitive areas. A description of various structure types and their costs are summarized in Table 3-4a.

Where double-circuit towers would be required for the proposed 345-kv and 115-kv lines, steel lattice is being proposed for the 345-kv line. Steel lattice and single-pole double-circuit structures are being considered for the 115-kv line. The double-circuit structures chosen would result from engineering and environmental considerations and permitting conditions prescribed by land managers and the counties.

3.7 Analysis of Alternative Corridors

The alternative corridors resulting from the constraint mapping process (described in Section 3.6.1), and input from federal, state and local agencies, were carefully evaluated and compared. Alternative corridors connecting mid (Grand Junction, Montrose, etc.) and end (Rifle and San Juan Generating Station) points along the line were compared. Six sections between mid or end points were evaluated. The various alternative corridors between points can be combined to yield a total project alternative. However, for convenience, and to provide practical comparisons, discussions are limited to those alternatives within a particular section (e.g., Rifle-Grand Junction).

Each alternative corridor consists of several segments, with some segments common to several corridors. A summary of the alternative corridors and their component segments is provided in Table 3-5. The location of each segment is depicted in Figures 3-9, 3-11, and 3-13.

The various alternatives were analyzed using a numerical value system. The intent was to provide a systematic way to compare the potential for adverse environmental impacts between alternative corridors. It is important to note that the numeric analyses are only a tool to assist in the comparisons; many other factors are also involved in the corridor evaluation process, such as engineering constraints, cost, public input, agency input, etc. Many of these factors cannot be quantified for incorporation into a numerical analysis, but are important considerations in the selection of the preferred corridor.

Included in this section is an overview of the methodology employed in the alternative corridor analysis, summary tables of the results, a discussion of the advantages and disadvantages of each alternative corridor as it relates to others within the same

Table 3-4a

Alternative Support
Structure Types

	345-kv Steel Pole	345-kv Wood H-Frame	345-kv Steel Pole H-Frame	345-kv Steel Lattice H-Frame	345-kv Single Circuit Steel Lattice	345-kv Double Circuit Steel Lattice	115-kv Double Circuit Steel Lattice	115-kv Double Circuit Steel Pole
1. Number of structures per mile	6.6	7.5	4.4	4.4	4.4	4.4	5.3	6.6
2. Structure Height meters (feet)	38 (125)	24 (80)	33 (110)	33 (110)	40 (130)	46 (150)	38 (125)	27 (90)
3. Land area per structure-sq. meters (sq. ft.)	2.3 (25)	8.4 (90)	9.3 (100)	11.2 (120)	83.6 (900)	148.7 (1,600)	37.2 (400)	1.5 (16)
4. Cost per tangent structure (dollars)	25,000	12,000	19,000	20,000	18,000	41,000	17,000	15,000
5. Foundation	Concrete Cassion	Direct Embediment	Concrete Embediment	Concrete Cassion	Concrete Cassion	Concrete Cassion	Concrete Cassion	Concrete Embediment
6. Width of right-of-way required-meters (feet)	30.5 (100)	38.1 (125)	45.7 (150)	45.7 (150)	45.7 (150)	53.3 (175)	45.7 (150)	30.5 (100)
7. Guying requirements	No	Yes	Yes	Yes	No	No	No	No
8. Construction cost per mile (dollars)	315,000	250,000	273,000	280,000	260,000	520,000	213,000	240,000

Table 3-5
ALTERNATIVE CORRIDORS AND
ASSOCIATED SEGMENTS

Rifle Substation-Grand Junction Substation

Alternative	Segments
A	3a,3c,3h,3f,3i,3g,5a
B	3a,3b,3d,3f,3i,3g,5a
C	3a,3b,3e,3i,3g,5a
D	1a,1e,4,5a
E	1a,1c,1d,4,5a
F	1b,1d,4,5a
G	1b,1c,1e,4,5a
*H	3a,3c,3i,3g,5a
Grand Junction Substation-Montrose Substation	
A	5b,12,14a,14b
*B	5b,12,14a,14d,14c
C	5b,12,14e,17a,14c
Montrose Substation-Norwood Substation Site	
*A	14c,17a,19a,21
B	15c,15d,20a,21
C	14c,17a,17b,18,22c
D	14c,17a,17b,18,24,25b
E	15c,15e,20a,21
Norwood Substation Site-Montezuma/La Plata Co. Line	
A	29a,29b,29c,29d,30c,30d,30e
*B	29a,29b,29c,30b,30d,30e and 29d
C	29a,29b,30a,30e and 29c,29d
Montezuma/La Plata Co. Line-Long Hollow Substation	
A	31a,31b,31e,31f
B	31a,31d,31g,31f
*C	32a,32c
D	32a,32b
E	32a,31h,31g,31f
Long Hollow Substation-San Juan Generating Station	
A	33,35a,35b
*B	33,35a,35c,36b
C	33,34,36a,36b
D	31f,31e,31c,36a,36b

*Participants Proposed Corridor

section, and identification and justification of the project participants' preferred corridor and the Agencies' (REA, BLM, FS) preferred corridor.

3.7.1 Methodology For Impact Rating System

3.7.1.1. General Approach

The following numerical value procedure was selected and developed to evaluate the relative advantages and disadvantages of alternative corridors. The method is an adaptation of a similar procedure utilized by the BLM (Richfield, Utah District) for the Moon Lake Project EIS (BLM 1981a). It was initially developed for the Federal Colstrip Transmission Study Project (Geological Survey, U.S., 1979). The procedure was used to derive numerical values relating to the overall potential for impact along each alternative corridor. Both the seriousness and relative importance of impacts on each resource are taken into consideration. The resultant impact scores can then be used to make direct comparisons between alternative corridors within each resource category.

Resource information used in the comparisons is taken from the segment profiles included in Section 4.12. The total number of miles a segment crosses a mapped resource was determined for each segment and summed for each alternative corridor. Some resources, such as stream crossings, were recorded in units rather than linear miles.

Environmental resource categories (e.g. vegetation) were divided into more specific units termed "data items" (e.g. pinon-juniper) in the analysis. A list of these resource categories and their associated data items used in the analysis is provided in Table 3-6.

Number values, which relate to the sensitivity of the resource to impact, were applied by placing each data item into a low, moderate, or high category, based on an estimate of the seriousness of the impact likely to occur to that data item. Each successively higher category was considered to be about twice as potentially detrimental in impact as the one before it. Numeric values of 1, 2 and 4 were applied to the low, moderate, and high categories, respectively, and were used to calculate the impact scores.

The length, in miles, that each data item was crossed by the corridor segments was multiplied by the corresponding numeric value for that data item. The sum of these values for all data items represents the resource category impact score for the corridor being evaluated.

Table 3-6
Data Items and Associated Impact
Sensitivities for Rifle-San Juan Project

Data Item	Relative Seriouness of Impact
Vegetation (Ecotype)	
Conifer-Aspen	H (high)
Saltbush-Greaswood	M (moderate)
Mountain Shrub	M
Pinon-Juniper	L (low)
Sagebrush-Grassland	L
Barren	L
Geologic Hazard	
Stable	L
Unstable	M
Erosion Hazard	
Low	L
Moderate	M
High	H
Reclamation Potential	
High	L
Moderate	M
Low	H
Land Use	
Prime Farmland	H
Irrigated Cropland	H
Nonirrigated Cropland	M
Commercial Forest	H
Riparian/Wetlands	
Major River Crossings	H
Perennial Streams	M
Intermittent Streams	L
Human Resources	
High Density	H
Low Density	L
Recreation Areas	H
Nonsettled Areas	L
Visual Resources	
High Impact	H
Moderate Impact	M
Low Impact	L
Wildlife	
Mule Deer/Elk Calving and Fawning Areas	M
Mule Deer/Elk Critical Winter Range	M
Bald Eagle Concentration Areas	M
Cultural Resources	
High Sensitivity	H
Moderate Sensitivity	M
Low Sensitivity	L

3.7.1.2 Resource Categories and Data Item Values

The resource categories listed in Table 3-6 are considered to be important and have a reasonable potential to be impacted during construction, operation, and maintenance of the project. They are not all equally important or sensitive to impact; however, a determination of their relative importance is reserved for the individual decision-maker.

The numeric values assigned to data items were determined through consultation with representatives of BLM, Forest Service, Western, Colorado-Ute, and Burns & McDonnell. The value assigned to each data item was based on several factors including:

1) Nature of the impact
2) Duration of the impact
3) Time of year the impact would be likely to occur
4) Likelihood of the impact to be mitigated
5) Indirect effects on that data item

The following is a very brief summary of the composition and value of the various data items included in each resource category. A more detailed discussion of the derivation of each data item and its associated impact value is included in Appendix B.

Vegetation (Ecotype)

The vegetation category consists of the general natural vegetation types crossed by the corridors. These types are: conifer-aspen, saltbush-greasewood, pinon-juniper, mountain shrub, sagebrush-grassland, and barren. A description of each is provided in Section 4.6.

Conifer-aspen was rated as high in impact potential. Saltbush-greasewood and mountain shrub received a moderate rating. Pinon-juniper, sagebrush-grasslands and barren areas were rated low in impact potential. Impact values primarily relate to the importance attached to the loss of that vegetation type at tower locations and along access roads, as well as the long-term effects of right-of-way maintenance.

Erosion Hazard

Erosion hazards (low, moderate, high) were derived from generalized soil bodies crossed by the corridors. The ratings are based on mean annual precipitation, elevation, slope, soil texture, and other soil properties. Low, moderate, and high hazard areas are rated low, medium and high in impact potential. Soils included in each category are tabulated in Section 4.4.

Reclamation Potential

This category is also a function of the soil type crossed and its impact rating is determined by such criteria as mean annual temperature, length of frost-free season, depth of soil, moisture retention capacity, and vegetative cover. Areas were rated as good, fair or poor in reclamation potential. Poor potential suggests that revegetation may be more difficult; these areas were given a high impact rating. Fair and good areas are rated medium and low in impact potential, respectively. Reclamation potentials for the various soils crossed by the corridors are provided in Section 4.4.

Riparian/Wetland Areas

This category predicts the potential for impact to riparian zones and wetlands where the corridor crosses streams. Three data items are listed--major river crossings, perennial stream crossings, and intermittent stream crossings. Major crossings are those where the riparian zone is wider than 1000 feet and would be difficult to span. These crossings are considered to have high impact potential. Perennial streams and intermittent streams are rated moderate and low, respectively.

Geologic Hazard

The geologic hazard category consists of two data items, stable and unstable areas. Unstable areas are inferred to be underlain by landslide deposits and could represent a geologic hazard (Colton et.al. 1975). Unstable areas are rated moderate in impact potential, while stable areas are rated low.

Land Use

The four principal land-use types potentially affected by the project are prime farmlands, irrigated croplands, nonirrigated croplands and commercial forest. Prime farmlands are an extremely valuable resource that should be avoided where practicable and potential impacts to this resource was given a high rating. Irrigated croplands have the potential to be affected by tower placement that could disrupt irrigation patterns, and was also assigned a high rating. Nonirrigated lands would be less likely to be impacted and are thus rated medium. Commercial forest areas would be removed from production for the life of the project and thus are rated as high in impact potential.

Human Resources

This category is used as an indicator of the distribution of populated areas within the corridors. Data items included are high density areas, where the average tract size is less than 32 ha (80 acres); low density areas where the average tract size is

greater than 32 ha (80 acres); recreation areas; and nonsettled lands. The last data item includes public lands that are not available for settlement. High density and recreation areas are rated high; low density and nonsettled areas are rated low.

Visual

An assessment of the visual impact potential was based on both the ability of the landscape to conceal the transmission line from viewers (visual absorption capacity) and the user sensitivity of the area crossed by the corridor. These two components were combined to yield a final impact potential rating of high, moderate, or low.

Wildlife

Wildlife resources important to the corridor comparison are big game calving and fawning areas, and critical winter range; and bald eagle hunting and concentration areas. Since timing of construction can greatly reduce the potential for impacting these animals, all three data items are rated as moderate in impact potential.

Cultural Resources

The potential for affecting archaeological and historical sites along the corridors was assessed by determining the number of miles each corridor crossed areas of high, moderate, and low sensitivity. Sensitivity ratings were established using information on known prehistoric and historic sites, potential site areas based on nearby field studies, and the professional judgement of the field archaeologist (Nickens & Associates, 1982). Highly sensitive areas were rated as having high impact potential, while areas moderate or low in sensitivity were given moderate or low impact ratings.

Parallel of Existing Right-of-Way

The number of miles alternative corridors parallel existing transmission rights-of-way are also listed in the comparison tables; however, no numeric of value was assigned to this item. Three lines could be paralleled--Colorado-Ute's 115-kv line, Western's Rifle to Curecanti 230-kv line supported by steel lattice towers, and PSC's Rifle-Cameo 230-kv line supported by wood-pole H-frame structures.

Parallelling existing rights-of-way can, in most cases, greatly reduce the amount of new access required for transmission line construction. Conversely, the close proximity of the two lines could produce greater impacts than if the lines were located in separate corridors. The cumulative effect can only be determined by examining each alternative corridor on a case-by-case basis.

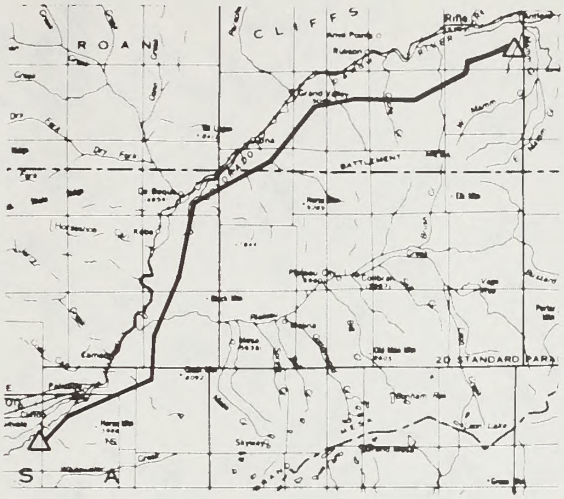
3.7.2 Comparison of Alternative Corridors

3.7.2.1 Rifle-Grand Junction

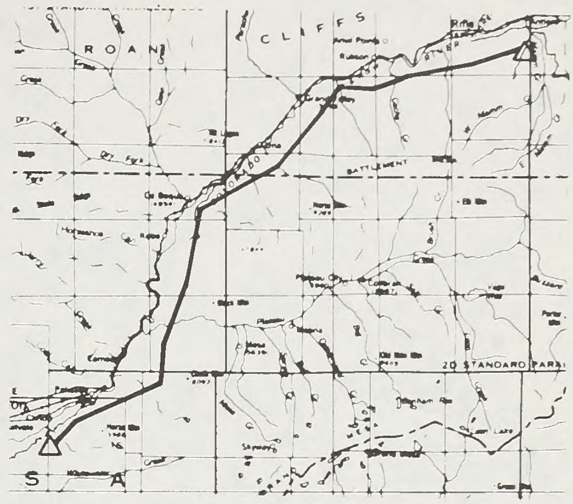
Eight alternative corridors, each corridor being composed of various segments, were evaluated between Rifle and Grand Junction. Four of the alternatives, A, B, C and H are located in or in close proximity to the Colorado River Valley (see Figures 3-7, 3-8, and 3-9). The other four alternatives D, E, F and G, proceed south of the Rifle Substation along either Colorado-Ute's Rifle-Collbran-Grand Junction 115-kv transmission line or Western's Rifle-Curecanti 230-kv transmission line for approximately 24 km (15 miles) and then parallel Colorado-Ute's Rifle-Collbran-Grand Junction 115-kv line to the Grand Junction Substation.

Alternative A is composed of segments 3a, 3c, 3h, 3f, 3j, 3g and 5a (See Figure 3-9). It parallels PSC's existing 230-kv line initially, but diverges to the southwest to avoid Battlement Mesa. It rejoins the PSC line just southwest of Battlement Mesa and parallels it to near Cameo where it turns south to parallel the Colorado-Ute 115-kv line into the Grand Junction Substation. Alternative A would be located within an area planned for development by the Rifle Ski Corporation. Alternative A would have the lowest expected impact on riparian zones and cultural resources and would be expected to cause the least amount of soil erosion of all the alternatives (see Table 3-7). It also would have a low potential impact to land uses, visual resources, and populated areas. This alternative received a high potential impact rating for wildlife; and disturbed areas would be more difficult to reclaim. Construction costs for Alternative A would be approximately $18.5 million.

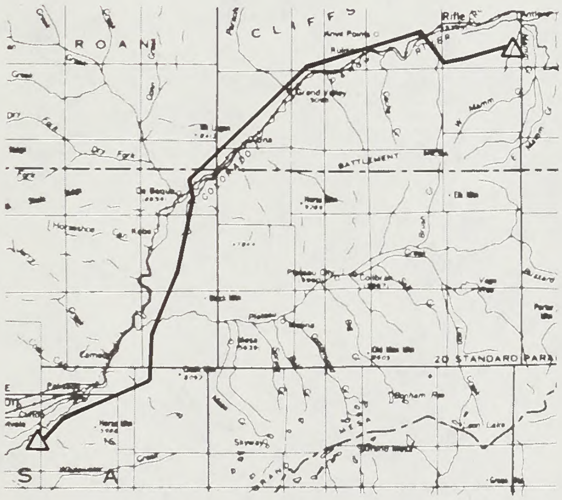
Alternative B is the shortest alternative and is composed of segments 3a, 3b, 3d, 3f, 3j, 3g, and 5a. It is similar to A, but parallels the PSC line from near the Rifle Substation to a point near Cameo. This is considered its primary advantage since less new access would be required. Alternative B would affect the least natural vegetation, and would have a low impact on riparian zones (see Table 3-7). A disadvantage is the alternative's potential to impact the relatively densely populated areas along the south side of the Colorado River between Rifle and Parachute. The corridor goes directly through the developing community of Battlement Mesa. Crossing these developing areas would result in relatively high impacts on land uses (agricultural lands) and visual resources. Estimated cost for Alternative B would be approximately $18.4 million, but this might be reduced if adequate access is available along major portions of the existing PSC line.



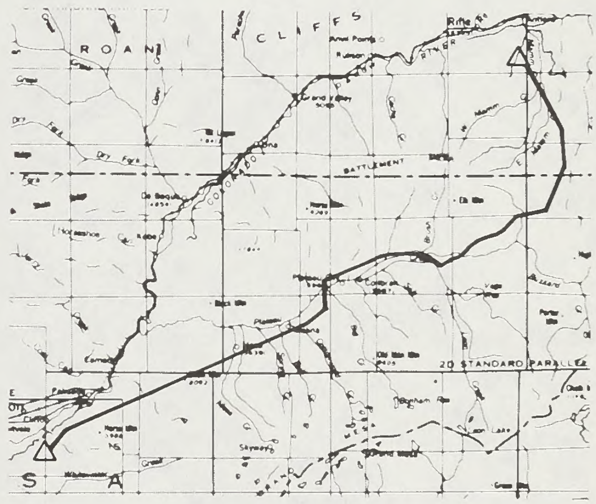
ALTERNATIVE A
SEGMENTS 3a, 3c, 3h, 3f, 3j, 3g, 5a



ALTERNATIVE B
SEGMENTS 3a, 3b, 3d, 3f, 3j, 3g, 5a



ALTERNATIVE C
SEGMENTS 3a, 3b, 3e, 3j, 3g, 5a



ALTERNATIVE D
SEGMENTS 1a, 1e, 4, 5a

5 0 5 10 15
Statute Miles

5 0 5 10 15
Kilometers

* Participants' proposed corridor

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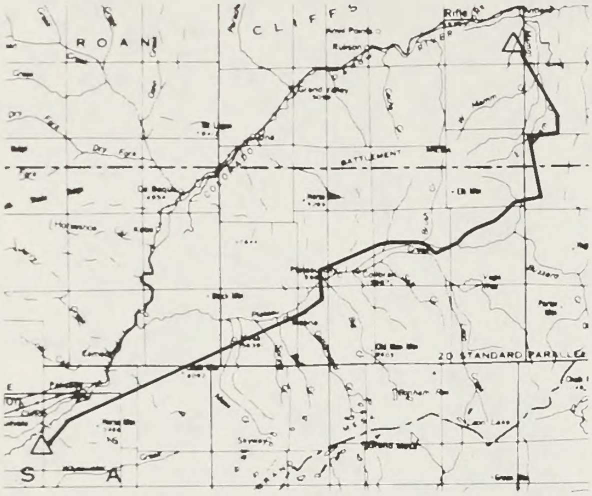
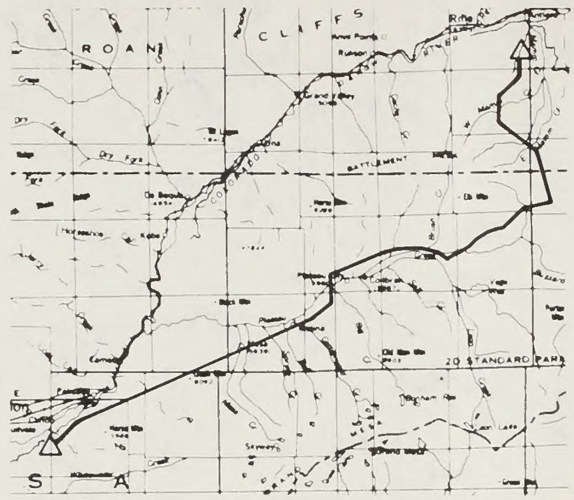
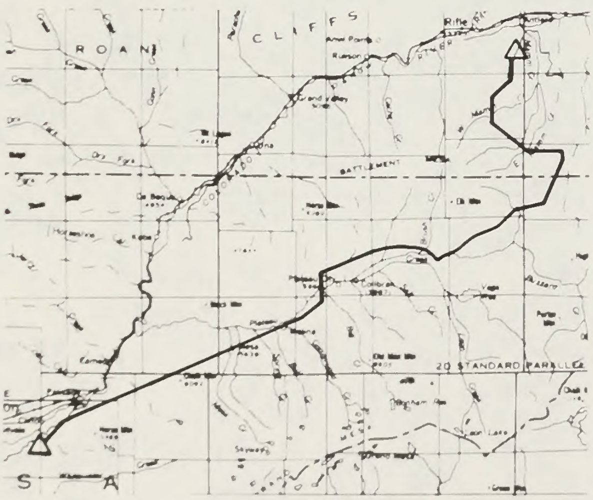
Figure 3-7
RIFLE SUBSTATION TO
GRAND JUNCTION SUBSTATION
ALTERNATIVE CORRIDORS A-D



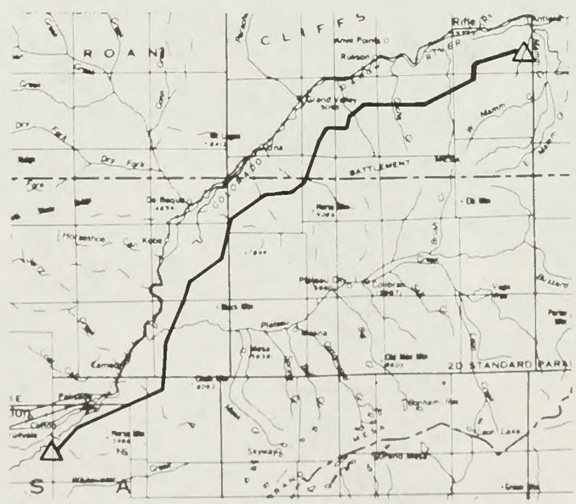
ALTERNATIVE E
SEGMENTS 1a, 1c, 1d, 4, 5a



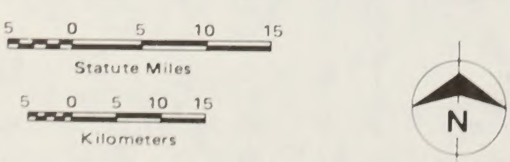
ALTERNATIVE F
SEGMENTS 1b, 1d, 4, 5a



ALTERNATIVE G
SEGMENTS 1b, 1c, 1e, 4, 5a



ALTERNATIVE *H
SEGMENTS 3a, 3c, 3i, 3g, 5a



* Participants' proposed corridor

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Figure 3-8
RIFLE SUBSTATION TO GRAND JUNCTION SUBSTATION ALTERNATIVE CORRIDORS E-H

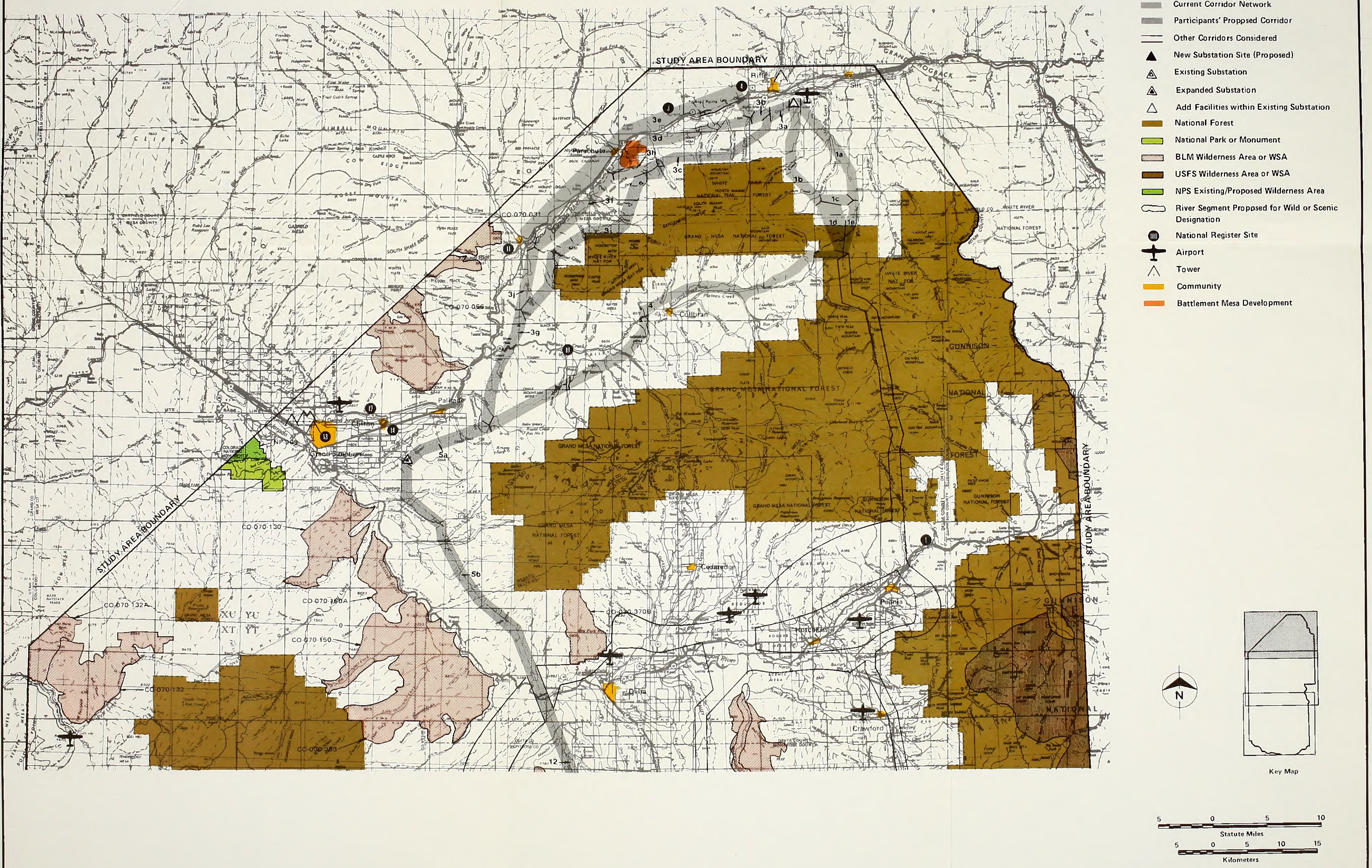

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Figure 3-9

RIFLE - SAN JUAN PROJECT
ALTERNATIVE CORRIDORS
NORTHERN SECTION

Table 3-7

RIFLE SUBSTATION TO GRAND JUNCTION SUBSTATION
ALTERNATIVE CORRIDOR COMPARISONS

Resource Data Items	A		B		C		D		E		F		G		H	
	Miles[a]	Score[b]	Miles[a]	Score[b]	Miles[a]	Score[b]	Miles[a]	Score[b]	Miles[a]	Score[b]	Miles[a]	Score[b]	Miles[a]	Score[b]	Miles[a]	Score[b]
Vegetation																
Conifer-Aspen	4.2	16.8	0.0	0.0	0.0	0.0	1.0	4.0	1.5	6.0	4.5	18.0	4.0	16.0	1.0	4.0
Pinyon-Juniper	31.8	31.8	26.1	26.1	26.5	26.5	14.0	14.0	14.0	14.0	18.4	18.4	22.4	22.4	43.9	43.9
Saltbush and Greasewood	3.2	6.4	3.2	6.4	11.7	23.4	3.2	6.4	3.2	6.4	3.2	6.4	3.2	6.4	3.2	6.4
Mountain Shrub	4.3	8.6	4.3	8.6	4.3	8.6	20.3	40.6	20.3	40.6	20.3	40.6	20.3	40.6	4.3	8.6
Sagebrush and Grassland	0.0	0.0	0.0	0.0	0.0	0.0	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	0.0	0.0
Barren	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		63.6		41.1		58.5		67.5		69.5		85.9		87.9		62.9
Riparian (No. of Stream Crossings)																
Major Crossing	0	0.0	0	0.0	2	8.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Perennial	7	14.0	8	16.0	4	8.0	21	42.0	21	42.0	19	38.0	19	38.0	7	14.0
Intermittent	29	29.0	30	30.0	47	47.0	43	43.0	43	43.0	43	43.0	43	43.0	38	38.0
		43.0		46.0		63.0		85.0		85.0		81.0		81.0		52.0
Erosion Hazard																
Low	13.5	13.5	9.8	9.8	10.8	10.8	12.7	12.7	12.7	12.7	6.7	6.7	6.7	6.7	13.5	13.5
Moderate	42.5	85.0	46.0	92.0	48.2	96.4	52.1	104.2	52.6	105.2	58.0	116.0	61.5	103.0	42.5	85.0
High	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		98.5		101.8		107.2		116.9		117.9		122.7		109.7		98.5
Reclamation Potential																
Poor	21.5	86.0	33.8	135.2	18.1	72.4	6.5	26.0	6.5	26.0	6.5	26.0	6.5	26.0	5.9	23.6
Fair	22.7	45.4	19.2	38.4	38.1	76.2	51.7	103.4	52.7	105.4	51.4	102.8	52.4	104.8	27.5	55.0
Good	11.8	11.8	2.8	2.8	2.8	2.8	6.6	6.6	6.1	6.1	6.8	6.8	9.3	9.3	22.6	22.6
		143.2		176.4		151.4		136.0		137.5		135.6		140.1		101.2
Geologic Hazard (Potential)																
Stable	39.2	39.2	37.8	37.8	49.1	49.1	44.5	44.5	41.4	41.4	40.7	40.7	45.6	45.6	37.8	37.8
Unstable	16.8	33.6	18.0	36.0	9.9	19.8	20.3	40.6	23.9	47.8	24.0	48.0	22.6	45.2	18.2	36.4
		72.8		73.8		68.9		85.1		89.2		88.7		90.8		74.2
Wildlife																
Mule Deer and Elk Fawning and Calving Areas	10.0	20.0	3.8	7.6	19.0	38.0	3.0	6.0	3.0	6.0	5.0	10.0	9.0	18.0	14.8	29.6
Mule Deer and Elk Critical Winter Range	21.7	43.4	22.4	44.8	12.7	25.4	21.4	42.8	24.9	49.8	28.7	57.4	25.2	50.4	22.0	44.0
Bald Eagle Concentration Areas	29.3	58.6	45.1	90.2	48.3	96.6	3.5	7.0	3.5	7.0	3.5	7.0	3.5	7.0	20.0	40.0
		122.0		142.6		160.0		55.8		62.8		74.4		75.4		113.6
Land Use																
Prime Farmland	2.7	10.8	2.7	10.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Irrigated Cropland	2.5	10.0	10.0	40.0	6.7	26.8	19.3	77.2	19.3	77.2	15.8	63.2	15.8	63.2	1.3	5.2
Nonirrigated Cropland	7.3	14.6	9.5	19.0	9.8	19.6	4.5	9.0	4.5	9.0	0.0	0.0	0.0	0.0	2.3	4.6
Commercial Forest	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		35.4		69.8		46.4		86.2		86.2		63.2		63.2		9.8
Cultural Resources																
High	8.5	34.0	11.5	46.0	8.5	34.0	7.0	28.0	7.0	28.0	7.0	28.0	7.0	28.0	3.0	12.0
Medium	41.0	82.0	37.8	75.6	44.0	88.0	44.3	88.6	44.8	89.6	44.2	88.4	47.7	95.4	46.5	93.0
Low	6.5	6.5	6.5	6.5	6.5	6.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	6.5	19.5
		122.5		128.1		128.5		130.1		131.1		129.9		136.9		124.5
Visual Resources Impact																
Low	5.2	5.2	0.0	0.0	0.0	0.0	0.0	0.0	1.0	1.0	1.0	1.0	0.0	0.0	5.2	5.2
Moderate	13.9	27.8	10.4	20.8	12.9	25.8	3.2	6.4	1.7	3.4	1.7	3.4	3.2	6.4	17.9	35.8
High	36.9	147.6	45.4	181.6	46.1	184.4	61.6	246.4	62.6	250.4	62.0	248.0	65.0	260.0	32.9	131.6
		180.6		202.4		210.2		252.8		254.8		252.4		266.4		172.6
Human Resources																
High Density	5.8	23.2	19.0	76.0	17.0	68.0	8.0	32.0	8.0	32.0	8.0	32.0	8.0	32.0	4.3	17.2
Low Density	23.8	23.8	19.5	19.5	11.2	11.2	38.2	38.2	38.2	38.2	37.6	37.6	37.6	37.6	14.0	14.0
Recreation	0.0	0.0	0.0	0.0	0.0	0.0	2.2	8.8	2.2	8.8	2.2	8.8	2.2	8.8	0.0	0.0
Non-settled	26.4	26.4	17.3	17.3	30.8	30.8	16.4	16.4	16.9	16.9	16.9	16.9	20.4	20.4	37.7	37.7
		73.4		112.8		110.0		95.4		95.9		95.3		98.8		68.9
Parallel Existing ROW																
115-kV	8.5		8.5		8.5		74.5		62.5		49.0		61.0		8.5	
230-kV Wood	26.6		43.4		17.6		0.0		0.0		0.0		0.0		10.8	
230-kV Steel	0.0		0.0		0.0		9.7		3.7		0.0		6.0		0.0	
Estimated Cost (millions)	$18.5		$18.4		$19.5		$21.4		$21.6		$21.4		$22.5		$18.5	
Total Length for Alternative	56.0		55.8		59.0		64.8		65.3		64.7		68.2		56.0	

[a] *Miles of resource along alternative corridor. (Those resources where the quantitative measure is by numbers are so indicated.)*

[b] *Impact Score. Impact score is derived by the following formula: Miles (or nos.) of Resource x Data Item Impact Values = Impact Score.*

Alternative C is composed of segments 3a, 3b, 3e, 3j, 3g and 5a. It would be located north of the Colorado River from about 8 km (5 miles) west of Rifle to DeBeque. Alternative C was not extended west of DeBeque on the north side of the Colorado River due to rough terrain that would cause construction difficulties. Two BLM wilderness study areas are located in close proximity to the river west of DeBeque. Alternative C has a low potential to impact vegetation. It would cross Interstate 70 and the Colorado River (major river crossing) twice which would increase the potential for impacts to the adjacent riparian zone. It crosses more agricultural land than A, but less than B. A transmission line in Alternative C would be quite visible from Interstate 70. Alternative C crosses far less geologically unstable area than any of the other alternatives. One disadvantage is the increased potential to impact human resources near the Colorado River crossings (western crossing would be near DeBeque) and along the north side of the river near Parachute. Cost for Alternative C is estimated to be approximatly $19.5 million, higher than both A and B.

The other Colorado River Valley alternative is H, which consists of segments 3a, 3c, 3i, 3g, and 5a. Alternative H has the lowest potential impact rating of all the corridor alternatives for several of the resource categories. Specifically, it has the lowest potential to impact riparian zones, land uses, populated areas and visual resources (see Table 3-7). Alternative H is similar to A in that it parallels PSC's line out of the Rifle Substation and then turns southwest, away from the populated areas along the south side of the Colorado River. However, it differs from A since it would be out of the Colorado River Valley for the remainder of its length and avoids the impacts associated with those alternatives that extend along the valley. Like A, it would cross the area adjacent to the proposed Rifle Ski Area, where some residential development is planned. More mule deer and elk calving areas are crossed by H than the other three Colorado River Valley alternatives because it is located at intermediate elevations in the valley. The cost of constructing a line in Alternative H would be approximately $18.5 million, the same as Alternative A.

Alternative D is the one of four alternatives that head south from the Rifle Substation to parallel Colorado-Ute's 115-kv line via Collbran to Grand Junction. This alternative is composed of segments 1a, 1e, 4 and 5a. Alternative D parallels the Colorado-Ute 115-kv line for its entire length and also parallels Western's 230-kv line for 15.5 km (9.7 miles). It is approximately 8 km (5 miles) longer than any of the Colorado River

alternatives. One advantage of this corridor is it would have the least potential to affect the wildlife resource. Alternative D would cross far less bald eagle concentration areas than Alternatives A, B, C, and H. The additional length of Alternative D compared to A, B, C and H causes a higher potential for impact to most resource categories. However, there is not much difference between the four eastern corridors (D,E,F,G). The additional length (compared to A, B, C and H) results in a higher estimated construction cost for this alternative--$21.4 million.

Alternative E differs from D in that segment 1e is replaced by segments 1c and 1d (see Figure 3-9). The alternative would head southeast out of the Rifle Substation paralleling the Colorado-Ute 115-kv line and the Western 230-kv line for several miles. However, it diverges from those lines and heads west and then south and parallels the 115-kv line again in the Grand Mesa National Forest. From that point, Alternative D and E are identical. Alternative E has essentially the same advantages and disadvantages as Alternative D. However, it does not parallel as many miles of existing line and is slightly longer resulting in additional construction costs. The estimated construction cost for Alternative E is $21.6 million.

Alternative F which consists of segments 1b, 1d, 4 and 5a, differs from Alternatives E and D in that it heads directly south from the Rifle Substation, departing from the existing 115-kv line corridor. It would be a new corridor until well into the Grand Mesa National Forest where it would parallel the 115-kv line. Alternative F is slightly shorter than E but most of the advantages and disadvantages are similar. It would parallel less existing transmission line than both D and E and cross more mule deer and elk critical winter range and calving and fawning areas. It would also cross more conifer-aspen vegetation than the three other eastern alternatives. The estimated construction cost of Alternative F is approximately $21.4 million.

Alternative G, composed of segments 1b, 1c, 1e, 4 and 5a, is the longest of the eight alternatives. It would have the greatest potential to impact vegetation, cultural resources, and visual resources, most of which is due to its longer length. It differs from Alternative F by paralleling the Colorado-Ute 115-kv line and Western's 230-kv line well before they enter the Grand Mesa National Forest. Alternative G would have no advantage over any of the other alternatives. It was considered only because it represents a combination of the segments utilized for the other three eastern alternatives. Construction of Alternative G would cost approximately $22.5 million.

The project participants' preferred alternative corridor between Rifle and Grand Junction is Alternative H. Alternative H would have several advantages since it: 1) minimizes potential impacts to populated areas in the Colorado River Valley; 2) is not located in the area's primary viewshed for most of its length, thus minimizing visual impacts from residential areas and Interstate Highway 70 (I-70); and 3) crosses the least agricultural land of all the alternatives.

Alternatives D, E, F and G are not as attractive to the participants as the preferred corridor. At some time in the future, PSC may need to construct a 345/230-kv substation to support its existing 230-kv system in the Parachute/DeBeque area to serve the electrical load of the oil shale industry. The further south the Rifle-Grand Junction 345-kv line is located, the more costly it will be for PSC to interconnect the 345-kv and 230-kv systems.

The Agencies have evaluated the alternatives between Rifle and Grand Junction and also prefer Alternative H.

3.7.2.2 Grand Junction-Montrose

Three alternative corridors were evaluated between Colorado-Ute's Grand Junction Substation and the Montrose Substation (see Figures 3-10 and 3-11). All three alternatives have at least two corridor segments in common, 5b and 12. These two segments parallel Colorado-Ute's existing 115-kv transmission line for approximately 69 km (43 miles). From the south end of segment 12 to the Montrose Substation three alternatives were evaluated.

Alternative A, composed of segments 5b, 12, 14a and 14b is the shortest of the three alternatives. It parallels the Colorado-Ute 115-kv line into the Montrose Substation; therefore, more existing access would be available than with the other two alternatives. Alternative A has the lowest potential to impact vegetation, erosion hazards, wildlife, cultural resources, human resources, riparian zones and visual resources (see Table 3-8). However, this is primarily due to the slightly shorter length of this alternative compared to Alternative B. Alternative A would affect more agricultural lands in the Shavano Valley than the other two alternatives, which is its primary disadvantage. The estimated construction cost of Alternative A is $16.6 million.

Alternative B, composed of segments 5b, 12, 14a, 14d and 14c (see Figure 3-11), departs from the existing 115-kv line northwest of Montrose, heads south, and enters into the Montrose Substation from the south. The line would be constructed to enter and exit the Montrose Substation on double-circuit towers, thus crossing

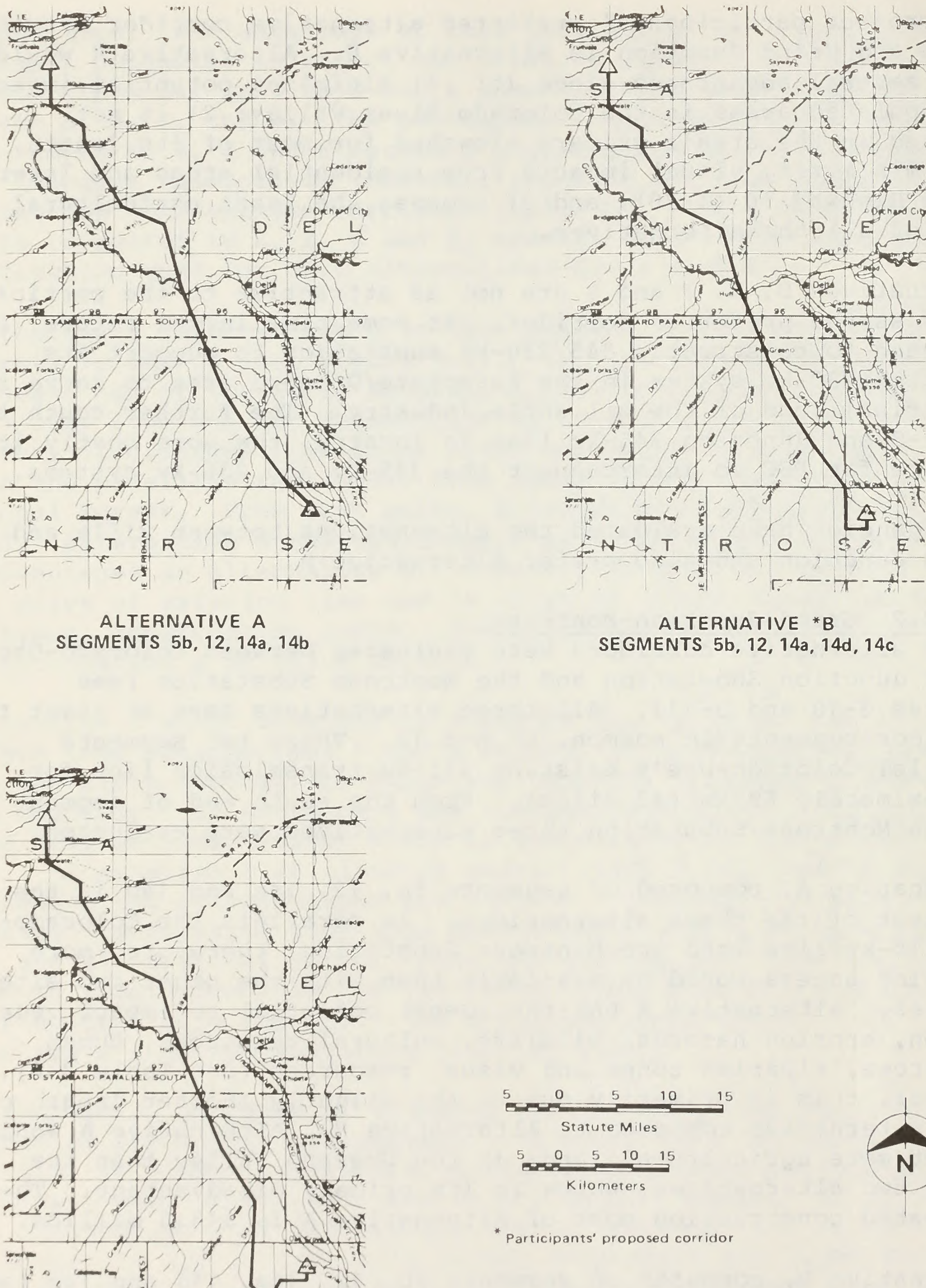

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Figure 3-10

GRAND JUNCTION SUBSTATION TO MONTROSE SUBSTATION ALTERNATIVE CORRIDORS

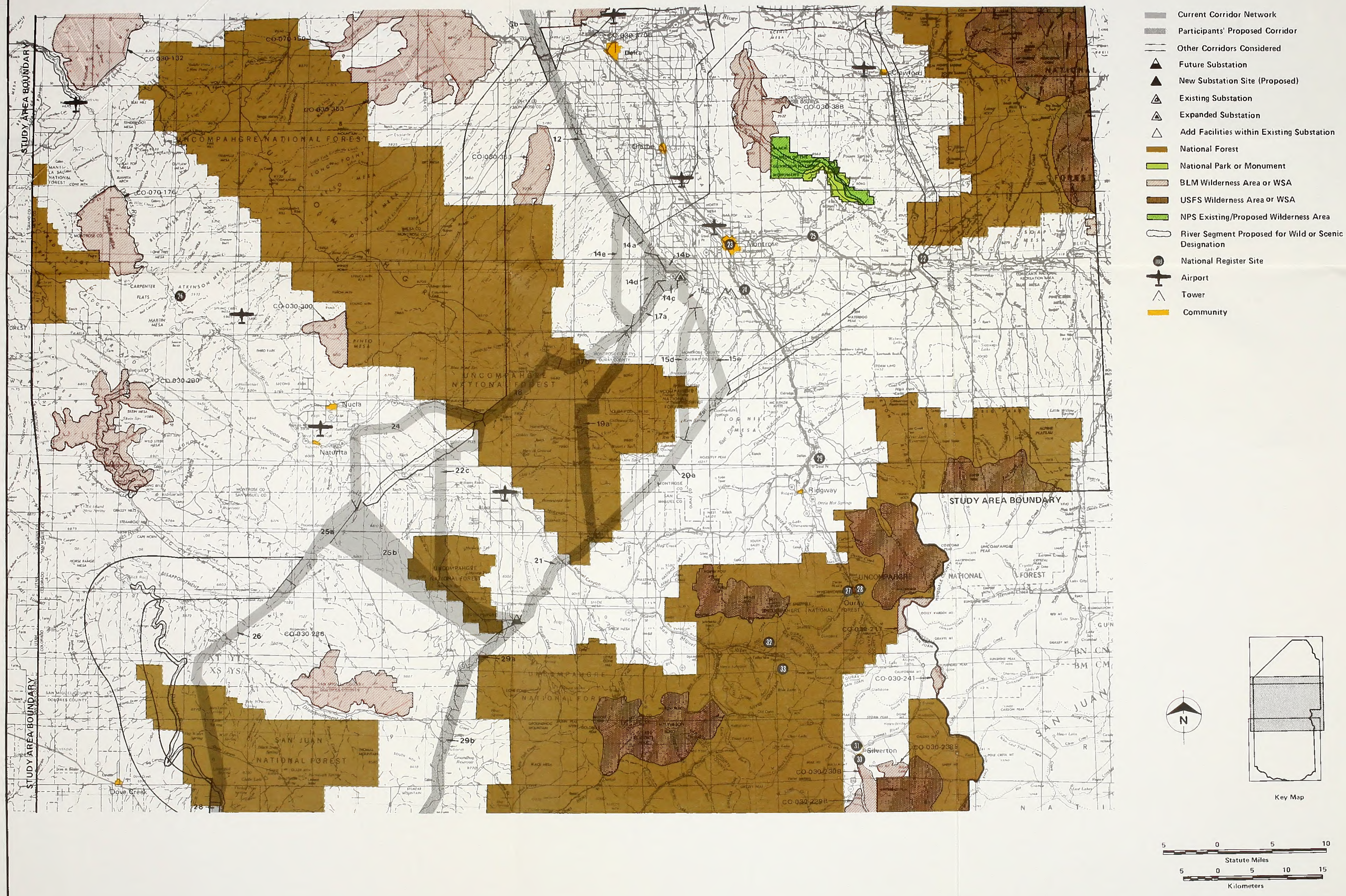

Figure 3-11

RIFLE - SAN JUAN PROJECT
ALTERNATIVE CORRIDORS
CENTRAL SECTION

Table 3-8

GRAND JUNCTION SUBSTATION TO NORWOOD SUBSTATION SITE
ALTERNATIVE CORRIDOR COMPARISONS

Grand Junction Substation to Montrose Substation

Resource Date Items	A Miles[a]	A Score[b]	B Miles[a]	B Score[a]	C Miles[a]	C Score[b]
Vegetation						
Conifer-Aspen	0.0	0.0	0.0	0.0	0.0	0.0
Pinyon-Juniper	9.0	9.0	11.0	11.0	19.2	19.2
Saltbush and Greasewood	27.1	44.1	27.1	44.1	27.1	44.1
Mountain Shrub	0.0	0.0	0.0	0.0	0.0	0.0
Sagebrush and Grassland	0.0	0.0	0.0	0.0	0.0	0.0
Barren	0.0	0.0	0.0	0.0	0.0	0.0
		53.1		55.1		63.3
Riparian (No. of Stream Crossings)						
Major Crossing	0	0.0	0	0.0	0	0.0
Perennial	4	8.0	5	10.0	5	10.0
Intermittent	30	30.0	35	35.0	30	30.0
		38.0		45.0		40.0
Erosion Hazard						
Low	25.4	25.4	25.4	25.4	25.4	25.4
Moderate	24.8	49.6	26.1	52.2	35.5	71.0
High	0.0	0.0	0.0	0.0	0.0	0.0
		75.0		77.6		96.4
Reclamation Potential						
Poor	25.4	101.6	25.4	101.6	25.4	101.6
Fair	24.8	49.6	26.1	52.2	35.5	71.0
Good	0.0	0.0	0.0	0.0	0.0	0.0
		151.2		153.8		172.6
Geologic Hazard (Potential)						
Stable	50.2	50.2	48.3	48.3	56.2	56.2
Unstable	0.0	0.0	3.2	6.4	4.7	9.4
		50.2		54.7		65.6
Wildlife						
Mule Deer and Elk Fawning and Calving Areas	3.5	7.0	2.8	5.6	2.8	5.6
Mule Deer and Elk Critical Winter Range	17.0	34.0	18.0	36.0	27.0	54.0
Bald Eagle Concentration Areas	18.3	36.6	19.6	39.2	29.0	58.0
		77.6		80.8		117.6
Land Use						
Prime Farmland	4.6	18.4	4.6	18.4	2.8	11.2
Irrigated Cropland	8.3	33.2	7.6	30.4	7.6	30.4
Nonirrigated Cropland	1.2	2.4	1.2	2.4	4.2	8.4
Commercial Forest	0.0	0.0	0.0	0.0	0.0	0.0
		54.0		51.2		50.0
Cultural Resources						
High	24.8	99.2	26.1	104.4	35.5	142.0
Medium	0.0	0.0	0.0	0.0	0.0	0.0
Low	25.4	25.4	25.4	25.4	25.4	25.4
		124.6		129.8		167.4
Visual Resources Impact						
Low	0.0	0.0	0.0	0.0	0.0	0.0
Moderate	0.5	1.0	1.5	3.0	1.0	2.0
High	49.7	198.8	50.0	200.0	59.9	239.6
		199.8		203.0		241.6
Human Resources						
High Density	3.8	15.2	5.8	23.2	6.3	25.2
Low Density	15.2	15.2	13.5	13.5	13.9	13.9
Recreation	1.8	7.2	1.8	7.2	1.8	7.2
Nonsettled	29.4	29.4	30.4	30.4	38.9	38.9
		67.0		74.3		85.2
Parallel Existing ROW						
115-kV	50.2		46.7		42.9	
230-kV Wood	0.0		0.0		0.0	
230-kV Steel	0.0		0.0		0.0	
Estimated Cost (millions)	$16.6		$17.2		$20.7	
Total Length of Alternative	50.2		51.5		60.9	

Montrose Substation to Norwood Substation Site

Resource Date Items	A Miles[a]	A Score[b]	B Miles[a]	B Score[b]	C Miles[a]	C Score[b]	D Miles[a]	D Score[b]	E Miles[a]	E Score[b]
Vegetation										
Conifer-Aspen	15.5	62.0	21.2	84.8	15.3	61.2	23.3	93.2	16.4	65.6
Pinyon-Juniper	8.7	8.7	9.4	9.4	22.6	22.6	15.8	15.8	14.7	14.7
Saltbush and Greasewood	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mountain Shrub	15.8	31.6	8.6	17.2	8.5	17.0	20.8	41.6	8.6	17.2
Sagebrush and Grassland	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Barren	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		102.3		111.4		100.8		150.6		97.5
Riparian (No. of Stream Crossings)										
Major Crossing	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Perennial	5	10.0	4	8.0	5	10.0	6	12.0	4	8.0
Intermittent	11	11.0	13	13.0	4	4.0	21	21.0	21	21.0
		21.0		21.0		14.0		33.0		29.0
Erosion Hazard										
Low	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Moderate	42.3	84.6	41.7	83.4	49.1	98.2	62.9	125.8	42.3	84.6
High	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		84.6		83.4		98.2		125.8		84.6
Reclamation Potential										
Poor	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.2	32.8
Fair	42.3	84.6	41.7	83.4	49.1	98.2	62.9	105.8	34.1	68.2
Good	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		84.6		83.4		98.2		105.8		101.0
Geologic Hazard (Potential)										
Stable	35.5	35.5	37.6	37.6	39.2	39.2	55.2	55.2	38.3	38.3
Unstable	6.8	13.6	4.2	8.4	9.9	19.8	7.7	15.4	4.0	8.0
		49.1		46.0		59.0		70.6		46.3
Wildlife										
Mule Deer and Elk Fawning and Calving Areas	6.0	12.0	5.0	10.0	6.8	13.6	6.8	13.6	7.3	14.6
Mule Deer and Elk Critical Winter Range	17.6	35.2	15.1	30.2	13.5	27.0	10.2	20.4	14.8	29.6
Bald Eagle Concentration Areas	9.0	18.0	20.0	4.0	13.6	27.2	12.2	24.4	2.0	4.0
		65.2		48.2		67.8		58.4		48.2
Land Use										
Prime Farmland	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Irrigated Cropland	0.5	2.0	0.5	2.0	2.7	10.8	2.0	8.0	0.8	3.2
Nonirrigated Cropland	1.8	3.6	1.8	3.6	0.0	0.0	1.0	2.0	1.8	3.6
Commercial Forest	8.5	34.0	3.0	12.0	17.8	71.2	14.3	57.2	2.0	8.0
		39.6		17.6		81.2		67.2		14.8
Cultural Resources										
High	9.0	36.0	10.0	40.0	41.3	165.2	53.1	212.4	13.8	55.2
Medium	33.3	66.6	31.8	63.6	0.0	0.0	2.0	4.0	28.5	57.0
Low	0.0	0.0	0.0	0.0	7.8	7.8	7.8	7.8	0.0	0.0
		102.6		103.6		173.0		224.2		112.2
Visual Resources Impact										
Low	13.7	13.7	8.2	8.2	3.5	3.5	0.0	0.0	8.2	8.2
Moderate	6.2	12.4	6.4	12.8	10.6	21.2	16.5	33.0	3.8	7.6
High	22.4	89.6	27.1	108.4	35.0	140.0	46.4	185.6	30.3	121.2
		115.7		129.4		164.7		218.6		137.0
Human Resources										
High Density	3.3	13.2	7.0	28.0	6.8	27.2	3.3	13.2	6.5	26.0
Low Density	10.4	10.4	15.3	15.3	4.0	4.0	16.7	16.7	15.0	15.0
Recreation	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Nonsettled	28.6	28.6	19.4	19.4	38.3	38.3	42.9	42.9	20.8	20.8
		52.2		62.7		69.5		72.8		61.8
Parallel Existing ROW										
115-kV	7.0		0.0		22.6		43.6		0.0	
230-kV Wood	0.0		0.0		0.0		0.0		0.0	
230-kV Steel	13.8		25.3		0.0		0.0		30.6	
Estimated Cost (millions)	$14.0		$13.8		$16.2		$20.8		$14.0	
Total Length of Alternative	42.3		41.7		49.1		62.9		42.3	

[a] *Miles of resource along alternate corridor (Those resources where the quantitative measure is by numbers are so indicated.)*

[b] *Impact Score. Impact score is derived by the following formula: Miles (or Nos.) of Resource x Data Item Impact Values = Impact Score.*

the Shavano Valley only one time. Alternative B has a slightly higher potential for impact in most resource categories and its estimated construction cost ($17.2 million) is higher than Alternative A, primarily due to its longer length. Its advantage is it would affect less irrigated cropland than Alternative A. The Montrose County Commissioners support use of Alternative Corridor B.

Alternative C is composed of segments 5b, 12, 14e, 17a, and 14c. It is the longest of the three alternatives by over 14.5 km (9 miles). It diverges from the existing 115-kv line north of Alternative B and extends farther south. It is similar to Alternative B since it enters the Montrose Substation from the south. Like Alternative B, only one crossing of the Shavano Valley, south of the substation site, would be required. Due to its length, Alternative C has the greatest potential to impact almost all resource categories; however, it would affect the least amount of agricultural land. The estimated construction cost of Alternative C is approximately $20.7 million.

The project participants' preferred alternative corridor is Alternative B.

Although Alternative B is slightly longer than A, it minimizes potential effects on agricultural lands in the Shavano Valley, which was considered an important priority. Alternative B is also more favorable to local government officials.

The Agencies preferred corridor between Grand Junction and Montrose is Alternative B.

<u>3.7.2.3 Montrose - Norwood Substation Site</u>

A Norwood area 345/115-kv substation is planned for the future. It would serve the growing electric loads of San Miguel Power Association. Its potential location is a site approximately 16 km (10 miles) southeast of Norwood (see Figure 3-11). Five corridor alternatives were evaluated between the Montrose Substation and the Norwood Substation site (see Figures 3-11 and 3-12).

Alternative A, is composed of segments 14c, 17a, 19a, and 21. It would have the least potential to impact cultural resources, visual resources and high density human resource areas (see Table 3-8). Alternative A crosses more critical winter range than the other alternatives, and therefore, has a higher potential to impact deer and elk. Construction scheduling should minimize most of the wildlife impacts, however. The primary advantage of Alternative A is less potential to impact land uses and private

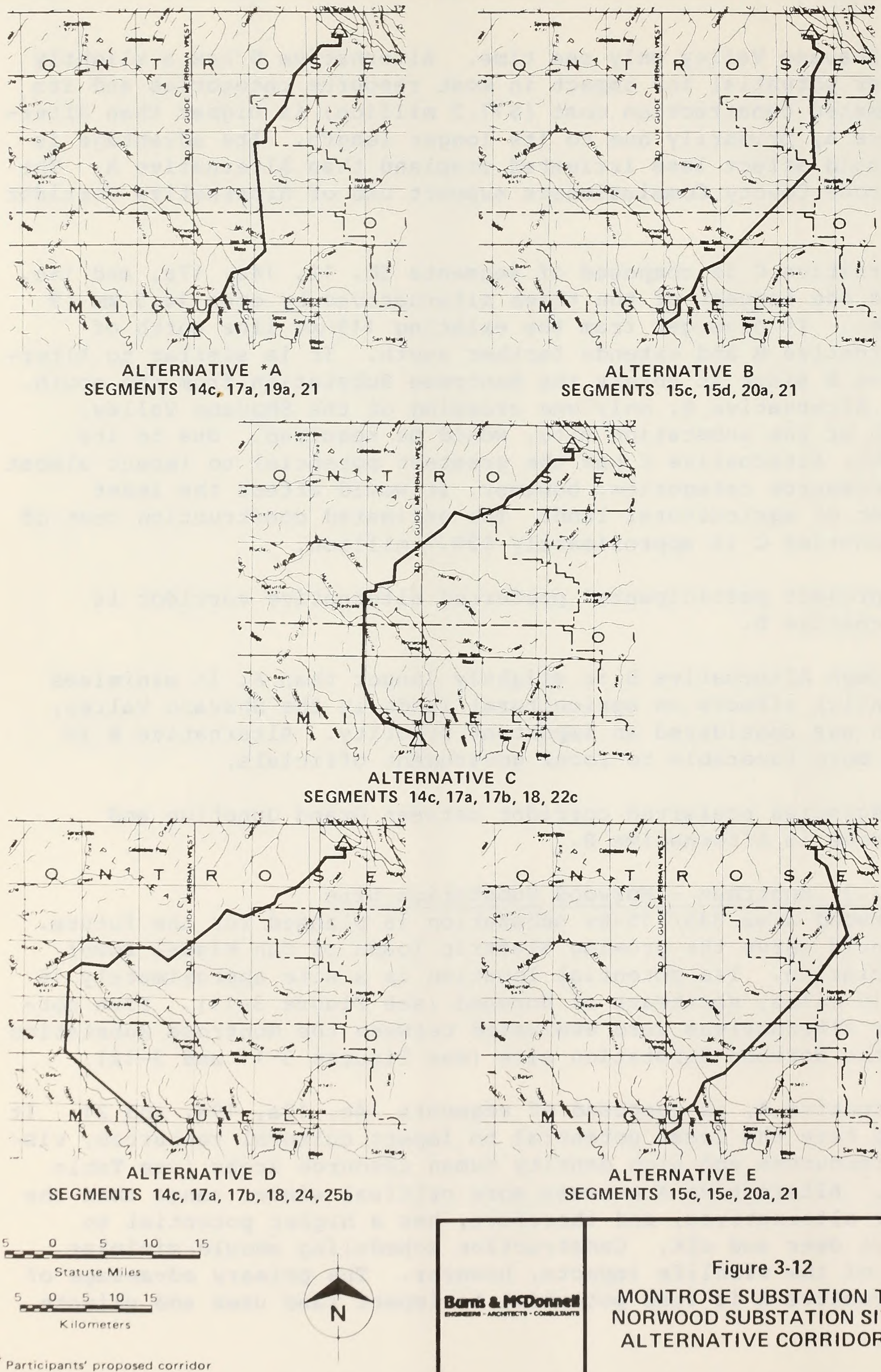

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Figure 3-12
MONTROSE SUBSTATION TO NORWOOD SUBSTATION SITE ALTERNATIVE CORRIDORS

landowners. The estimated construction cost for Alternative A is approximately $14 million.

Alternative B is composed of segments 15c, 15d and 20a, and 21. It crosses more small private land parcels (high density human resource areas) than Alternative A. Alternative B would have the lowest potential to impact wildlife, the lowest potential erosion and geologic hazards and the highest reclamation potential.

Alternative B parallels about 40 km (25 miles) of the existing Western 230-kv line, but has high vegetation impact potential since more of the conifer-aspen ecotype would be crossed. Alternative B has the lowest estimated construction cost, approximately $13.8 million.

Alternative C, which is composed of segments 14c, 17a, 17b, 18 and 22c (see figure 3-12), is about 11 km (7 miles) longer than Alternatives A or B. Alternative C parallels the existing Colorado-Ute Montrose-Nucla-Lost Canyon 115-kv line for 36.2 km (22.6 miles). It crosses more pinon-juniper vegetation which contributes to lower vegetation impact potential than A or B. Alternative C crosses the least number of riparian areas. The estimated construction cost is $16.3 million.

Alternative D, is composed of segments 14c, 17a, 17b, 18, 24 and 25b (see Figures 3-11 and 3-12). Alternative D parallels Colorado-Ute's Montrose-Nucla-Lost Canyon 115-kv line for about 70.4 km (44 miles) before proceeding southeasterly to the proposed Norwood Substation site. Alternative D is about 32 km (20 miles) longer than Alternatives A, B, and E and is 22.4 km (14 miles) longer than C. Its length and higher potential for environmental impacts, make it the least desirable of all alternatives. Its estimated construction cost is $20.8 million.

Alternative E is composed of segments 15c, 15e, 20a, and 21. It is identical to Alternative B, except it parallels more of Western's existing 230-kv line. Alternative E has the least potential to impact land use since it crosses only 3.2 km (2 miles) of commercial timber (see Table 3-8). Alternatives A, B and E traverse less than 1.6 km (1 mile) of irrigated cropland and no prime farmland. Alternative E also has the least potential to impact vegetation. Alternative E has a greater potential to impact the human component than Alternative A, but less than the others. The estimated construction cost for Alternative E is the same as Alternative A, approximately $14 million.

Alternatives A, B and E would have less environmental conflicts than C or D, and are similar in length, miles of existing transmission line corridor paralleled, and cost.

Alternatives B and E cross substantially more small private land parcels and land that is subdivided in the Government Springs Road-Dave Wood Road-Log Hill Mesa-Horsefly areas than Alternative A which would avoid these areas. Opposition to a transmission line in Alternative B or E from private landowners in these areas was expressed at a meeting held on November 2, 1982 in Montrose. Additional opposition to a line in B or E was expressed at public meetings held March 23, and March 24, 1983 in Durango and Montrose, respectively. Three area landowners submitted written comments to REA after these meetings. Two of the letters identified concerns about impacts to farming and ranching operations, and suggested routing the line on as much public land as possible. The third letter cited past landowner opposition to a second parallel 230-kv circuit studied by the Bureau of Reclamation in the early 1970's. The Ouray County Commissioners have indicated by resolution that it would be very difficult to obtain a Ouray County Special Use Permit for either Alternative B or E.

Alternatives A, B and E would have similar potential to impact the environment, except for the land use, human, and local government concerns identified in the Government Springs Road-Dave Wood Road-Log Hill Mesa-Horsefly areas; therefore, Alternative A is the participants' preferred corridor from Montrose to the Norwood Substation site.

Alternative A is also the Agencies preferred corridor.

An alternative between Montrose and the Montezuma/La Plata County line has also been evaluated. This alternative is composed of corridor segments 14c, 17a, 17b, 18, 24, 25a, 26, 28, 30c, 30d and 30e (see Figures 3-11 and 3-13). This alternative parallels Colorado-Ute's existing 115-kv line from Montrose through Nucla through Lost Canyon to the Montezuma/La Plata County line. This alternative would pass through the Nucla area rather than the Norwood area. The future transformation step down location would be in the Nucla area, even though the electric loads appear to be developing faster to the east of this alternative corridor. This corridor is over 30 miles longer than the preferred corridor segments between Montrose and the Montezuma/La Plata County line. The impact potential for this alternative (see Table 3-9) is greater than the impact potential of the participants' preferred alternatives between Montrose and Norwood, and Norwood and the Montezuma/La Plata County line. Therefore, this long alternative is not as attractive to the participants as routing the line through the Norwood area.

Table 3-9

MONTROSE SUBSTATION TO MONTEZUMA/LA PLATA COUNTY LINE ALTERNATIVE CORRIDOR COMPARISON

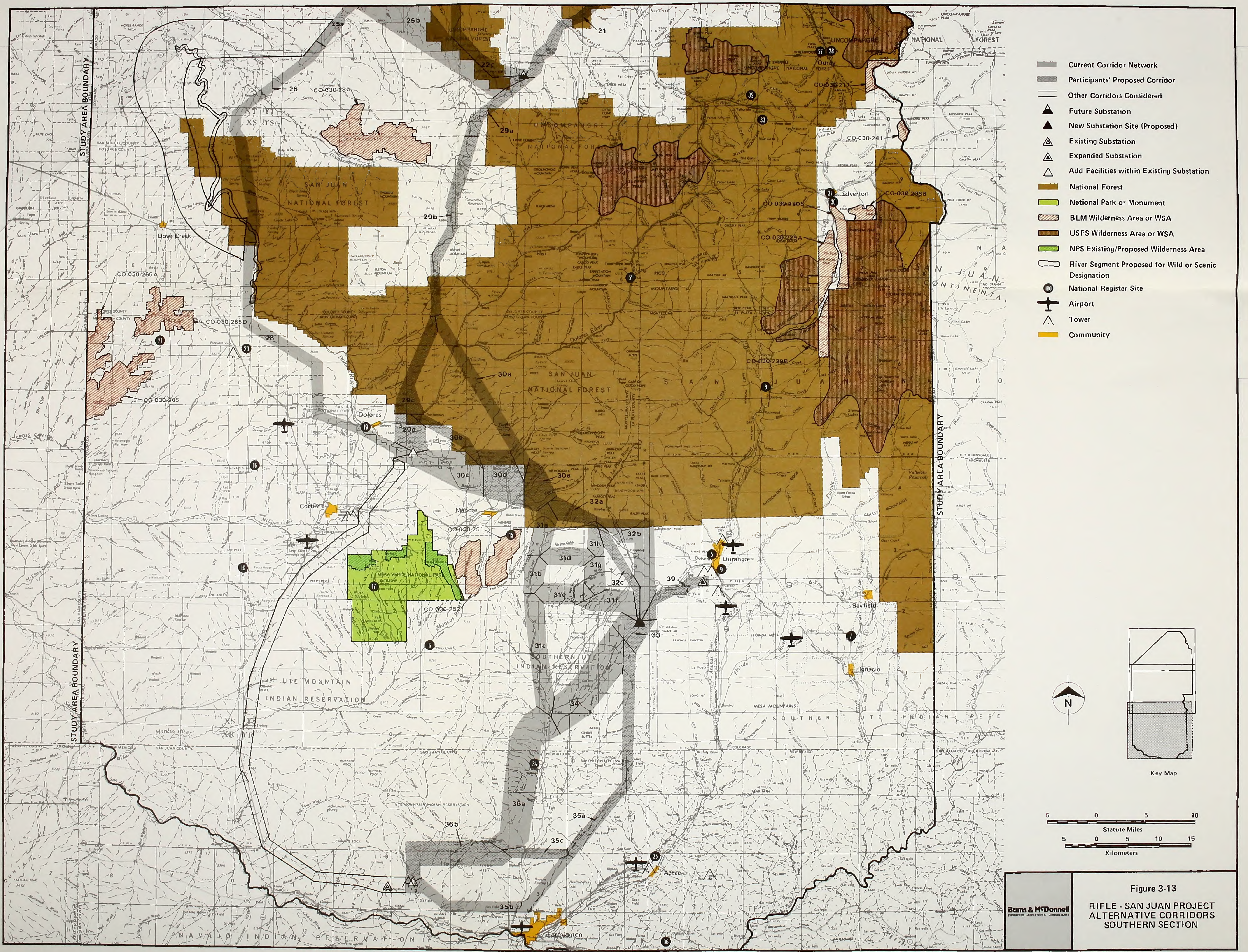
Resource Data Items	Miles[a]	Score[b]
Vegetation		
Conifer-Aspen	27.5	110.0
Pinyon-Juniper	35.5	35.5
Saltbush and Greasewood	5.0	10.0
Mountain Shrub	27.6	45.2
Sagebrush and Grassland	1.6	1.6
Barren	0.0	0.0
		202.3
Riparian (No. of Stream Crossings)		
Major Crossing	0	0.0
Perennial	11	22.0
Intermittent	38	38.0
		60.0
Erosion Hazard		
Low	14.4	14.4
Moderate	94.6	189.2
High	17.0	68.0
		271.6
Reclamation Potential		
Poor	6.9	27.6
Fair	119.1	238.2
Good	0.0	0.0
		265.8
Geologic Hazard (Potential)		
Stable	114.8	114.8
Unstable	11.2	22.4
		137.2
Wildlife		
Mule Deer and Elk Fawning and Calving Areas	12.6	25.2
Mule Deer and Elk Critical Winter Range	18.4	36.8
Bald Eagle Concentration Areas	34.9	69.8
		131.8
Land Use		
Prime Farmland	0.0	0.0
Irrigated Cropland	8.8	35.2
Nonirrigated Cropland	20.0	40.0
Commercial Forest	20.1	80.4
		155.6

Table 3-9 (continued)

Resource Data Items	Miles[a]	Score[b]
Cultural Resources		
High	74.7	298.8
Medium	43.5	87.0
Low	7.8	7.8
		393.6
Visual Resources Impact		
Low	6.5	6.5
Moderate	14.3	28.6
High	105.2	420.8
		455.9
Human Resources		
High Density	23.6	94.4
Low Density	33.1	33.1
Recreation	4.3	17.2
Non-settled	65.0	65.0
		209.7
Parallel Existing ROW		
115-kV	125.2	
230-kV Wood	0.0	
230-kV Steel	0.0	
Estimated Cost (millions)	$41.6	
Total Length of Alternative	126.0	

[a] *Miles of resource along corridor. (Those resources where the quantitative measure is by numbers are so indicated.)*

[b] *Impact Score. Impact score is derived by the following formula: Miles (or Nos.) of Resource x Data Item Impact Values = Impact Score.*


Current Corridor Network
Participants' Proposed Corridor
Other Corridors Considered
Future Substation
New Substation Site (Proposed)
Existing Substation
Expanded Substation
Add Facilities within Existing Substation
National Forest
National Park or Monument
BLM Wilderness Area or WSA
USFS Wilderness Area or WSA
NPS Existing/Proposed Wilderness Area
River Segment Proposed for Wild or Scenic Designation
National Register Site
Airport
Tower
Community
Key Map
Statute Miles
Kilometers
STUDY AREA BOUNDARY
SAN JUAN NATIONAL FOREST
UNCOMPAHGRE NATIONAL FOREST
MESA VERDE NATIONAL PARK
UTE MOUNTAIN INDIAN RESERVATION
SOUTHERN UTE INDIAN RESERVATION
NAVAJO INDIAN RESERVATION
Dove Creek
Dolores
Cortez
Mancos
Durango
Bayfield
Ignacio
Silverton
Aztec
Farmington
CO-030-265A
CO-030-265D
CO-030-265
CO-030-251
CO-030-252
CO-030-241
CO-030-217
CO-030-229B
CO-030-229A
CO-030-288
Barns & McDonnell
Figure 3-13
RIFLE - SAN JUAN PROJECT
ALTERNATIVE CORRIDORS
SOUTHERN SECTION

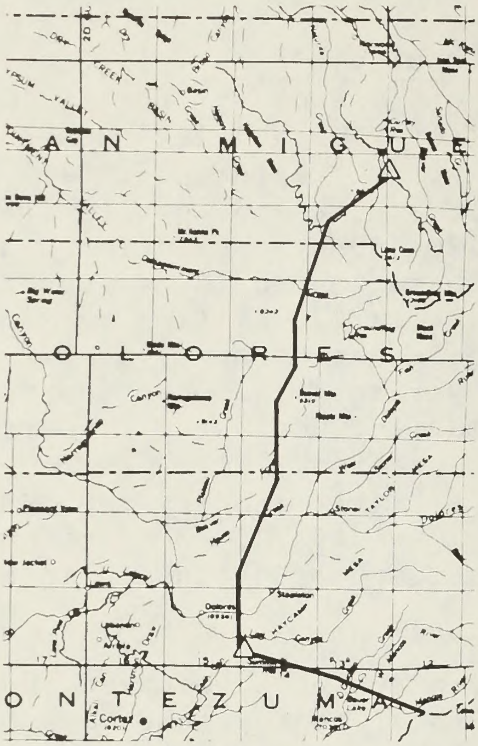
3.7.2.4 Norwood-Montezuma/LaPlata County Line

Colorado-Ute needs to supply power and energy to the Lost Canyon Substation near Dolores, Colorado (see Figure 3-13) to serve the loads of Empire Electric Association. The existing 230-kv and 115-kv transmission systems of Colorado-Ute and Western are interconnected at the Lost Canyon 230/115-kv Substation. A 345-kv source at the Lost Canyon Substation could be provided when Western upgrades its Rifle-Shiprock 230-kv line to 345 kv. However, if the Western 230-kv line is not uprated, and if system conditions and system developments warrant, the proposed Rifle-San Juan 345-kv transmission line may include a tap line from the 345-kv line into the Lost Canyon Substation. If the Rifle-Shiprock 230-kv line is uprated in a timely manner, the 345-kv tap line would not be constructed. New 345/115-kv transformation facilities would be required at Lost Canyon Substation in either event.

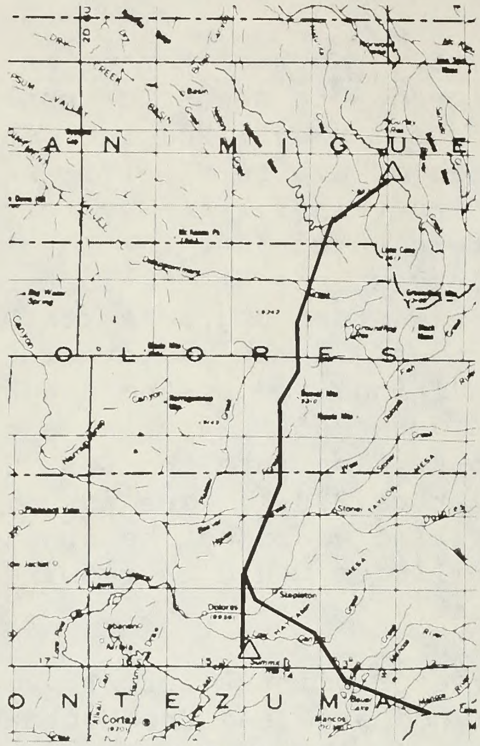
Three corridor alternatives have been evaluated between the Norwood area and the Montezuma/La Plata County line. One of these is Alternative A which is 87.5 km (54.7 miles) long and composed of segments 29a, 29b, 29c, 29d, 30c, 30d and 30e (see Figure 3-14). Alternative A goes through the Lost Canyon Substation, eliminating the need for a 345-kv tap line. Alternative A parallels either the Colorado-Ute 115-kv or Western's 230-kv transmission line for its entire length, thereby, reducing the potential impacts related to new disturbances for access.

Alternative A crosses the least amount of commercial forest and conifer-aspen ecotype, resulting in a lower vegetation and land use impact potential (see Table 3-10). Alternative A would have the greatest potential to impact human resources, since more than 16 km (10 miles) of high density population (human component) area is crossed. The Puett and Summit Reservoir State Fishing area is crossed by Alternative A, resulting in the highest potential impact on recreation. The public and landowners in the area east of Lost Canyon Substation believe corridor A is oversaturated with natural gas and carbon dioxide pipelines and electric transmission lines. The estimated construction cost is $18.1 million.

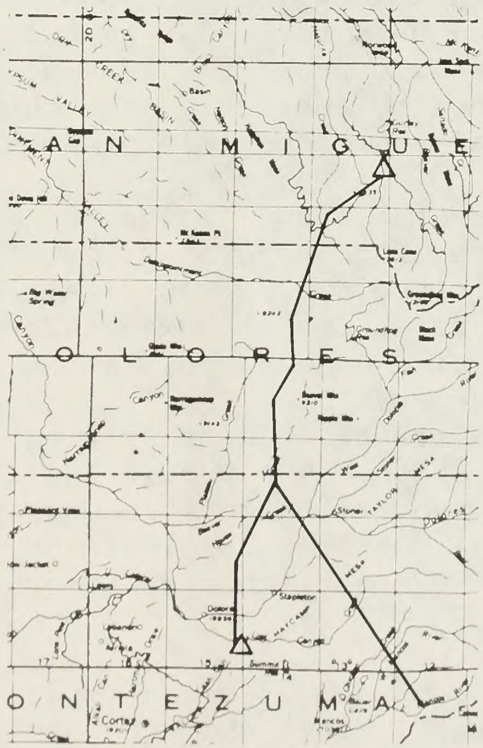
Alternative B is is composed of segments 29a, 29b, 29c, 30b, 30d, and 30e and is 1.6 km (1 mile) shorter than A. If a 345-kv tap line were required, it would be located in segment 29d and be approximately 5.1 km (3.2 miles) long. Alternative B would have the least potential to impact riparian areas, and compares favorably to the other alternatives for potential impacts to the vegetation and wildlife resources and the human component (see Table



ALTERNATIVE A
SEGMENTS 29a, 29b, 29c, 29d, 30c, 30d, 30e



ALTERNATIVE *B
SEGMENTS 29a, 29b, 29c, 30b, 30d, 30e and 29d



ALTERNATIVE C
SEGMENTS 29a, 29b, 30a, 30e and 29c, 29d

5 0 5 10 15
Statute Miles

5 0 5 10 15
Kilometers

N

* Participants' proposed corridor

Burns & McDonnell
ENGINEERS - ARCHITECTS - CONSULTANTS

Figure 3-14

NORWOOD SUBSTATION SITE TO MONTEZUMA/LA PLATA COUNTY LINE ALTERNATIVE CORRIDORS

Table 3-10

NORWOOD SUBSTATION SITE TO LONG HOLLOW SUBSTATION ALTERNATIVE CORRIDOR COMPARISONS

Norwood Substation Site to Montezuma – La Plata County Line

Resource Date Items	A		B: 345-kV Transmission Line		B: 345-kV Tap To Lost Canyon Substation[c]		C: 345-kV Transmission Line		C: 345-kV Tap To Lost Canyon Substation[c]	
	Miles[a]	Score[b]	Miles[a]	Score[b]	Miles[a]	Score[b]	Miles[a]	Score[b]	Miles[a]	Score[b]
Vegetation										
Conifer-Aspen	35.6	142.4	38.9	155.6	1.0	4.0	38.6	154.4	10.8	43.2
Pinyon-Juniper	6.5	6.5	6.5	6.5	0.0	0.0	6.5	6.5	0.0	0.0
Saltbush and Greasewood	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mountain Shrub	8.0	16.0	3.5	7.0	1.2	2.4	3.3	6.6	1.2	2.4
Sagebrush and Grassland	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Barren	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		164.9		169.1		6.4		167.5		45.6
Riparian (No. of Stream Crossings)										
Major Crossing	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Perennial	8	16.0	7	14.0	2	4.0	9	18.0	2	4.0
Intermittent	17	17.0	16	16.0	0	0.0	13	13.0	9	9.0
		33.0		30.0		4.0		31.0		13.0
Erosion Hazard										
Low	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Moderate	54.7	109.4	53.7	107.4	3.2	6.4	49.4	98.8	13.0	26.0
High	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		109.4		107.4		6.4		98.8		26.0
Reclamation Potential										
Poor	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fair	54.7	109.4	53.7	107.4	3.2	6.4	49.4	98.8	13.0	26.0
Good	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		109.4		107.4		6.4		98.8		26.0
Geologic Hazard (Potential)										
Stable	37.3	37.3	38.0	38.0	3.2	3.2	32.8	32.8	11.4	11.4
Unstable	17.4	34.8	17.4	34.8	0.0	0.0	16.5	33.0	1.7	3.4
		72.1		72.8		3.2		65.8		14.8
Wildlife										
Mule Deer and Elk Fawning and Calving Areas	4.9	9.8	4.9	9.8	0.0	0.0	5.4	10.8	0.0	0.0
Mule Deer and Elk Critical Winter Range	2.0	4.0	2.0	4.0	0.0	0.0	2.0	4.0	0.0	0.0
Bald Eagle Concentration Areas	4.0	8.0	1.7	3.4	2.3	4.6	0.0	0.0	4.0	8.0
		21.8		17.2		4.6		14.8		8.0
Land Use										
Prime Farmland	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Irrigated Cropland	4.6	18.4	4.1	16.4	1.0	4.0	1.0	4.0	1.0	4.0
Nonirrigated Cropland	0.0	0.0	0.7	1.4	0.0	0.0	0.0	0.0	0.0	0.0
Commercial Forest	15.1	60.4	29.1	116.4	0.0	0.0	30.9	123.6	0.0	0.0
		78.8		134.2		4.0		127.6		4.0
Cultural Resources										
High	14.0	56.0	5.0	20.0	3.2	12.8	7.0	28.0	3.2	12.8
Medium	40.7	81.4	48.7	97.4	0.0	0.0	39.2	78.4	13.0	26.0
Low	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		137.4		117.4		12.8		106.4		38.8
Visual Resources Impact										
Low	6.8	6.8	9.3	9.3	0.0	0.0	10.5	10.5	6.8	6.8
Moderate	13.4	26.8	12.9	25.8	0.5	1.0	16.7	33.4	0.5	1.0
High	34.5	138.0	31.5	126.0	2.7	10.8	22.2	88.8	5.7	22.8
		171.6		161.1		11.8		132.7		30.6
Human Resources										
High Density	10.3	41.2	4.3	17.2	1.0	4.0	0.0	0.0	1.0	4.0
Low Density	24.0	24.0	27.0	27.0	1.2	1.2	23.8	23.8	1.2	1.2
Recreation	2.8	11.2	0.6	2.4	0.0	0.0	0.0	0.0	0.0	0.0
Non-settled	17.6	17.6	21.8	21.8	1.0	1.0	25.6	25.6	10.8	10.8
		94.0		68.4		6.2		49.4		16.0
Parallel Existing ROW										
115-kV	15.1		7.3		0.0		3.0		0.0	
230-kV Wood	0.0		0.0		0.0		0.0		0.0	
230-kV Steel	39.6		36.4		3.2		26.6		13.0	
Estimated Cost (millions)	$18.1		$17.7		$1.3		$16.3		$5.3	
Total Length of Alternative	54.7		53.7		3.2		49.4		13.0	

Montezuma – LaPlata County Line to Long Hollow Substation

Resource Date Items	A		B		C		D		E	
	Miles[a]	Score[b]	Miles[a]	Score[b]	Miles[a]	Score[b]	Miles[a]	Score[b]	Miles[a]	Score[b]
Vegetation										
Conifer-Aspen	3.5	14.0	3.5	14.0	6.0	24.0	11.0	44.0	8.9	35.6
Pinyon-Juniper	2.7	2.7	4.1	4.1	0.0	0.0	0.0	0.0	4.1	4.1
Saltbush and Greasewood	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mountain Shrub	0.0	0.0	6.5	13.0	4.2	8.4	6.0	12.0	4.3	8.6
Sagebrush and Grassland	0.0	0.0	0.0	0.0	2.3	2.3	0.0	0.0	0.0	0.0
Barren	1.5	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		19.7		31.1		34.7		56.0		48.3
Riparian (No. of Stream Crossings)										
Major Crossing	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Perennial	4	8.0	4	8.0	2	4.0	3	6.0	3	6.0
Intermittent	7	7.0	3	3.0	3	3.0	4	4.0	5	5.0
		15.0		11.0		7.0		10.0		11.0
Erosion Hazard										
Low	12.4	12.4	11.2	11.2	3.3	3.3	1.5	1.5	7.8	7.8
Moderate	11.4	22.8	11.3	22.6	14.1	28.2	17.6	35.2	15.1	30.2
High	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		35.2		33.8		31.5		36.7		38.0
Reclamation Potential										
Poor	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fair	23.8	47.6	22.5	45.0	17.4	34.8	19.1	38.2	22.9	45.8
Good	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		47.6		45.0		34.8		38.2		45.8
Geologic Hazard (Potential)										
Stable	21.0	21.0	14.5	14.5	11.4	11.4	13.1	13.1	16.4	16.4
Unstable	2.8	5.6	8.0	16.0	6.0	12.0	6.0	12.0	6.5	13.0
		26.6		30.5		23.4		25.1		29.4
Wildlife										
Mule Deer and Elk Fawning and Calving Areas	15.1	30.2	10.5	21.0	5.4	10.8	10.6	21.2	10.5	21.0
Mule Deer and Elk Critical Winter Range	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bald Eagle Concentration Areas	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		30.2		21.0		10.8		21.2		21.0
Land Use										
Prime Farmland	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Irrigated Cropland	14.8	59.2	8.4	33.6	3.2	12.8	2.1	8.4	5.6	22.4
Nonirrigated Cropland	1.3	2.6	0.0	0.0	1.7	3.4	0.0	0.0	0.0	0.0
Commercial Forest	1.3	5.2	1.3	5.2	6.0	24.0	6.0	24.0	6.0	24.0
		67.0		38.8		40.2		32.4		46.4
Cultural Resources										
High	1.4	5.6	1.4	5.6	1.4	5.6	2.1	8.4	1.4	5.6
Medium	22.4	44.8	21.1	42.2	7.4	14.8	17.0	34.0	16.6	33.2
Low	0.0	0.0	0.0	0.0	8.6	8.6	0.0	0.0	4.9	4.9
		50.4		47.8		29.0		42.4		43.7
Visual Resources Impact										
Low	0.0	0.0	0.0	0.0	6.0	6.0	6.0	6.0	6.0	6.0
Moderate	8.0	16.0	8.2	16.4	3.4	6.8	0.0	0.0	5.1	10.2
High	15.8	63.2	14.3	57.2	8.0	32.0	13.1	52.4	11.8	47.2
		79.2		73.6		44.8		58.4		63.4
Human Resources										
High Density	0.0	0.0	0.0	0.0	0.0	0.0	8.1	32.4	0.0	0.0
Low Density	20.6	20.6	19.3	19.3	10.4	10.4	2.1	2.1	16.2	16.2
Recreation	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Non-settled	3.2	3.2	3.2	3.2	7.0	7.0	8.9	8.9	6.7	6.7
		23.8		22.5		17.4		43.4		22.9
Parallel Existing ROW										
115-kV	1.4		1.4		6.0		11.8		6.4	
230-kV Wood	0.0		0.0		0.0		0.0		0.0	
230-kV Steel	0.0		0.0		0.0		0.0		0.0	
Estimated Cost (millions)	$7.9		$7.4		$5.8		$6.3		$7.6	
Total Length of Alternative	23.8		22.5		17.4		19.1		22.9	

[a] *Miles of resource along alternate corridor (Those resources where the quantitative measure is by numbers are so indicated.)*

[b] *Impact Score. Impact score is derived by the following formula: Miles (or Nos.) of Resource x Data Item Impact Values = Impact Score.*

[c] *See discussion in Section 3.7.2.4.*

3-10). Alternative B has the greatest potential to impact land uses and would have higher impact on visual resources. The estimated construction cost is $17.7 million. The estimated construction cost of a tap line, if required, is $1.3 million.

Alternative C is the shortest of the three alternatives and is composed of segments 29a, 29b, 30a and 30e. If a 345-kv tap line were required, it would be located in segments 29c and 29d and be approximately 20.8 km (13 miles) long. Alternative C has the least potential to impact human resources, since only 1.6 km (1 mile) of high density settlement area and no recreation areas are crossed. Alternative C would have the least potential to impact visual resources, soils, cultural and wildlife resources. It is comparable to the other alternatives for potential impacts to vegetation and riparian areas.

Alternative C would cross the most commercial timber and the least irrigated cropland. The shortest length of existing transmission line is paralleled by C. The estimated construction cost is $16.3 million. The estimated cost of a tap line, if required, is approximately $5.3 million.

The difference in impacts between alternatives are generally not great since they each share a common corridor from Norwood to the Dolores/Montezuma County line. The primary factors influencing potential impacts of one alternative over the other is whether the Lost Canyon tap is constructed, and the length of corridor that crosses small private land parcels.

The primary disadvantage of Alternative A occurs in segment 30c, where potential impacts on small land parcels and recreation would be high. In addition, the Montezuma County Planning Commission and County Commissioners have expressed concerns about routing another transmission line east of the Lost Canyon Substation in segments 30c and 30d. This area contains many small land parcels and has already been impacted by a 115-kv transmission line and several pipeline rights-of-way.

Alternative B crosses fewer small land parcels than A. Alternative B would generally have less potential to impact the environment than Alternative A. Without construction of a 345-kv tap line, the costs for B would be lower than A.

Alternative C's primary advantages are it crosses the fewest small land parcels, no recreation areas, and has the least potential to impact soils, visual, wildlife and cultural resources and the human component. If a 345-kv tap line is not required, Alternative C would have the least potential to impact the

environment and would be the most economical to construct (see Table 3-10). If a 345-kv tap line is required, Alternative B is more desirable. It compares favorably environmentally and would cost less to construct.

Colorado-Ute is participating with officials of Montezuma County, and representives of the San Juan National Forest to study utility corridor alternatives in the area northeast of the Lost Canyon Substation. The area being studied is generally bounded by the top of segment 30a, the west side of segments 29c and 29d and the bottom of segments 30c and 30d (see Figure 3-13). The participants prefer Alternative B, pending the outcome of the evaluation by the joint study team.

The Agencies will select a preferred corridor after the evaluation by the joint study team is completed.

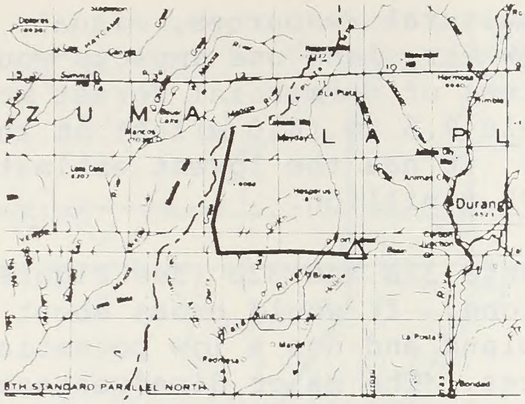
3.7.2.5 Montezuma/La Plata County Line - Long Hollow

Five alternative corridors were evaluated between the Montezuma/ La Plata County Line and the site of the proposed Long Hollow 345/115 kv Substation (see Figures 3-13 and 3-15). A substation connected to the Rifle-San Juan Transmission Line is needed at the Long Hollow site to provide power and energy to serve the loads of La Plata Electric Association, Inc.

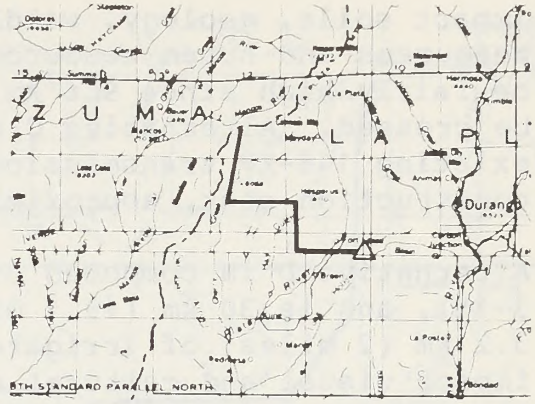
Alternative A, composed of segments 31a, 31b, 31e and 31f (see Figure 3-15) is the longest of the five alternatives, but parallels the shortest distance of the existing 115-kv transmission line. Alternative A crosses the most irrigated cropland 23 km (14.5 miles), and has the greatest potential to impact soils, wildlife, land use, cultural resources and visual resources (see Table 3-10). Alternative A has the potential to impact the least amount of sensitive vegetative ecotypes. The estimated construction cost is $7.8 million.

Alternative B is composed of segments 31a, 31d, 31g and 31f, and would parallel the same amount of the existing 115-kv transmission line and be about the same length as Alternative A. Alternative B has the greatest geologic hazard potential. The terrain would be rugged and access limited for this alternative. Cultural resource and visual impacts would be high, but potential land use impacts would be fairly low since the alternative crosses only 2 km, (1.3 miles) of commercial forest. The estimated construction cost is approximately $7.4 million.

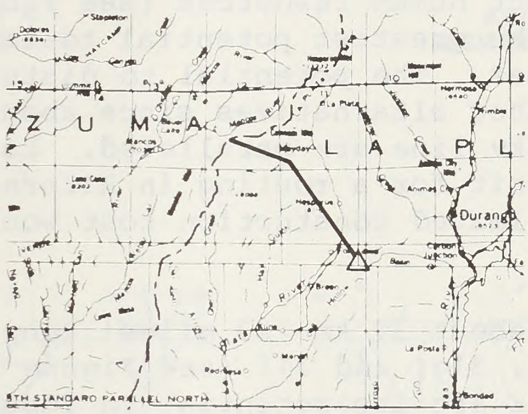
Alternative C, composed of segments 32a and 32c (see Figure 3-15), would be the shortest, most direct route to the proposed Long Hollow Substation. Alternative C has the least potential to



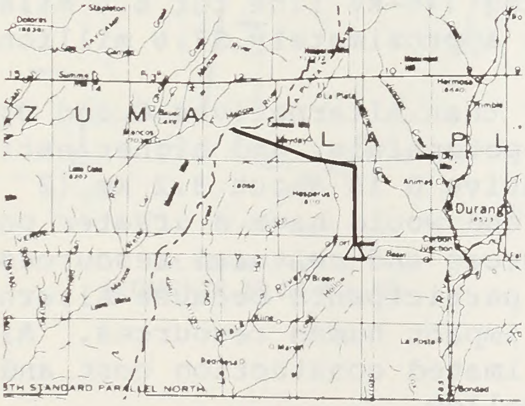
ALTERNATIVE A
SEGMENTS 31a, 31b, 31e, 31f



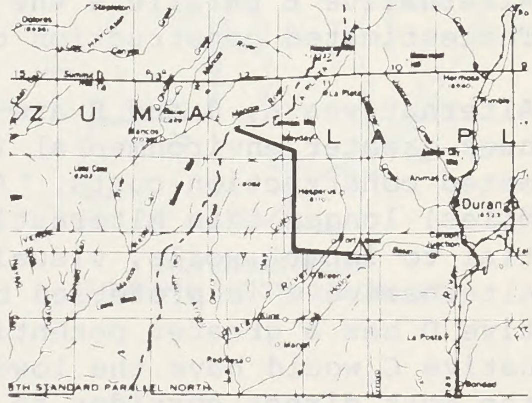
ALTERNATIVE B
SEGMENTS 31a, 31d, 31g, 31f



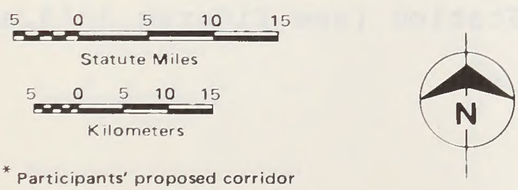
ALTERNATIVE *C
SEGMENTS 32a, 32c



ALTERNATIVE D
SEGMENTS 32a, 32b



ALTERNATIVE E
SEGMENTS 32a, 31h, 31g, 31f



* Participants' proposed corridor

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Figure 3-15

MONTEZUMA/LA PLATA COUNTY LINE TO LONG HOLLOW SUBSTATION ALTERNATIVE CORRIDORS

impact soils, geology, wildlife, cultural resources, visual resources and human resources. However, land use impacts would be fairly high since 9.6 km (6 miles) of commercial forest would be crossed. Alternative C parallels 9.6 km (6.0 miles) of the existing 115-kv transmission line. It has the lowest estimated construction cost, approximately $5.8 million.

Alternative D is composed of segments 32a and 32b (see Figure 3-15), and is 30 km (19.1 miles) long. It would cross about 3.2 km (2 miles) of irrigated cropland and has a low potential to impact visual and cultural resources. The major disadvantage of Alternative D is that residental subdivisions are being planned and developed in and in close proximity to Alternative D. Land is being subdivided in segments 32a and 32b, causing a greater potential to impact human resources (see Table 3-10). Alternative D also has the greatest potential to impact sensitive vegetative ecotypes. The potential to disturb the soil would be lower than the other alternatives since about 19 km (12 miles) of the existing 115-kv line are paralleled. La Plata County denied a Special Use Permit for a routing in Alternative D proposed in 1980-81. The estimated constuction cost would be approximately $6.3 million.

Alternative E is about 37 km (23 miles) long and is composed of segments 32a, 31h, 31g, and 31f (see Figure 3-15). The major disadvantages of E are its potential to impact soils, sensitive vegetative ecotypes and land uses (see Table 3-10). Potential impacts to wildlife would be low. The potential impacts for E would be greater than Alternative C and less than Alternative A. Alternative E parallels the existing 115-kv line for 6.4 miles. The estimated construction cost is approximately $7.6 million.

Alternatives A, B and E are longer than Alternatives C and D, have greater environmental impact potentials, and higher estimated construction costs. Alternative D is about 3.2 km (2 miles) longer than Alternative C, and would have a greater potential to impact soils, visual resources and cultural resources. Alternative C is preferred by the participants because Alternative D has a greater potential to impact human resources. Alternative C would have the lowest estimated constuction cost and is the most direct corridor to Long Hollow.

<u>3.7.2.6 Long Hollow Substation to San Juan Generating Station</u>
Four alternative corridors were evaluated between the Long Hollow Substation and San Juan Generating Station (see Figures 3-13 and 3-16).

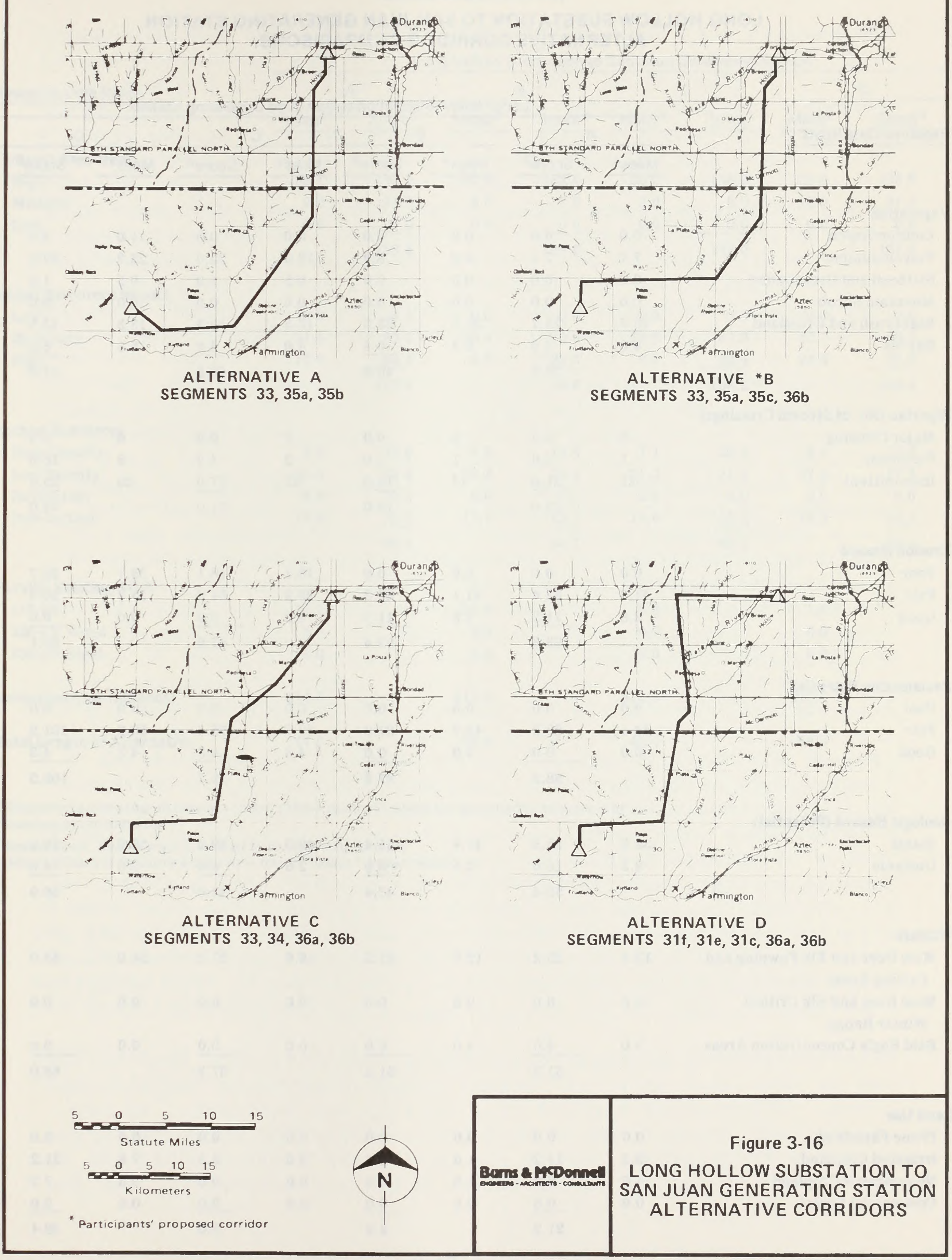

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Figure 3-16

LONG HOLLOW SUBSTATION TO SAN JUAN GENERATING STATION ALTERNATIVE CORRIDORS

Table 3-11

LONG HOLLOW SUBSTATION TO SAN JUAN GENERATING STATION ALTERNATIVE CORRIDOR COMPARISONS

Resource Data Items	Long Hollow Substation to San Juan Generating Station							
	A		B		C		D	
	Miles[a]	Score[b]	Miles[a]	Score[b]	Miles[a]	Score[a]	Miles[a]	Score[b]
Vegetation								
Conifer-Aspen	0.0	0.0	0.0	0.0	0.0	0.0	1.0	4.0
Pinyon-Juniper	7.1	7.1	8.9	8.9	22.0	22.0	22.2	22.2
Saltbush and Greasewood	0.0	0.0	0.0	0.0	0.5	1.0	0.5	1.0
Mountain Shrub	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sagebrush and Grassland	25.7	25.7	25.5	25.5	13.5	13.5	13.5	13.5
Barren	4.0	4.0	6.4	6.4	4.0	4.0	6.3	6.3
		36.8		40.8		40.5		47.0
Riparian (No. of Stream Crossings)								
Major Crossing	0	0.0	0	0.0	0	0.0	0	0.0
Perennial	1	2.0	1	2.0	2	4.0	8	16.0
Intermittent	21	21.0	16	16.0	27	27.0	29	29.0
		23.0		18.0		31.0		45.0
Erosion Hazard								
Poor	0.0	0.0	0.0	0.0	16.1	16.1	29.7	29.7
Fair	41.3	82.6	41.1	82.2	25.9	51.8	25.2	50.4
Good	2.8	11.2	2.8	11.2	0.0	0.0	0.0	0.0
		93.8		93.4		67.9		80.1
Reclamation Potential								
Poor	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fair	44.1	88.2	43.9	87.8	37.7	75.4	50.6	101.2
Good	0.0	0.0	0.0	0.0	4.3	4.3	4.3	4.3
		88.2		87.8		79.7		105.5
Geologic Hazard (Potential)								
Stable	35.8	35.8	41.4	41.4	40.0	40.0	52.9	52.9
Unstable	8.3	16.6	2.5	5.0	2.0	4.0	2.0	4.0
		52.4		46.4		44.0		56.9
Wildlife								
Mule Deer and Elk Fawning and Calving Areas	12.6	25.2	12.6	25.2	18.6	37.2	34.0	68.0
Mule Deer and Elk Critical Winter Range	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bald Eagle Concentration Areas	3.0	6.0	3.0	6.0	0.0	0.0	0.0	0.0
		31.2		31.2		37.2		68.0
Land Use								
Prime Farmland	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Irrigated Cropland	3.3	13.2	1.6	6.4	2.0	8.0	7.8	31.2
Nonirrigated Cropland	4.0	8.0	1.5	3.0	0.0	0.0	3.6	7.2
Commercial Forest	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		21.2		9.4		8.0		38.4

Table 3-11 (continued)

Resource Data Items	Long Hollow Substation to San Juan Generating Station A Miles[a]	Score[b]	B Miles[a]	Score[b]	C Miles[a]	Score[a]	D Miles[a]	Score[b]
Cultural Resources								
High	35.1	140.4	40.9	163.6	39.0	156.0	39.0	156.0
Medium	9.0	18.0	3.0	6.0	3.0	6.0	15.9	31.8
Low	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		158.4		169.6		162.0		187.8
Visual Resources Impact								
Low	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Moderate	31.5	63.0	38.0	76.0	33.9	67.8	30.1	60.2
High	12.6	50.4	5.9	23.6	8.1	32.4	24.8	99.2
		113.4		99.6		100.2		159.4
Human Resources								
High Density	8.5	34.0	3.6	14.4	7.1	28.4	3.1	12.4
Low Density	25.4	25.4	28.2	28.2	21.3	21.3	37.5	37.5
Recreation	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Non-settled	10.2	10.2	12.1	12.1	13.6	13.6	14.3	14.3
		69.6		54.7		63.3		64.2
Parallel Existing ROW								
115-kV	44.1		25.6		2.6		1.4	
230-kV Wood	0.0		0.0		0.0		0.0	
230-kV Steel	0.0		0.0		0.0		0.0	
Estimated Cost (millions)	$14.6		$14.5		$13.9		$18.1	
Total Length of Alternative	44.1		43.9		42.0		54.9	

[a] *Miles of resource along alternate corridor. (Those resources where the quantitative measure is by numbers are so indicated.)*

[b] *Impact Score. Impact score is derived by the following formula: Miles (or Nos.) of Resource x Data Item Impact Values = Impact Score*

Alternative A is composed of segments 33, 35a and 35b and parallels the existing Durango-Shiprock 115-kv line for its entire length. A substantial portion of this alternative crosses the Southern Ute Indian Reservation. Alternative A has the least potential to impact vegetation and wildlife since access into the corridor has already been provided by the existing line (see Table 3-11). Alternative A has the highest potential to impact high density population areas, since it crosses a developed area north of Farmington, New Mexico. The potential visual impacts would be high for the same reason. Alternative A is the second longest alternative, and therefore, has a greater potential to impact land uses and cultural resources. The estimated construction cost for Alternative A is approximately $14.6 million.

Alternative B is composed of segments 33, 35a, 35c, and 36b. It parallels the existing Durango-Shiprock 115-kv line for approximately 45.1 km (28 miles) to a point northeast of Farmington, where the corridor turns and heads west before turning south into the San Juan Generating Station. Alternative B has the lowest potential to impact human resources since the developed area north of Farmington is avoided. Alternative B crosses the least number of intermittent streams and therefore, has the lowest potential to impact riparian communities. Alternative B is about the same length as A, but has a lower potential to impact visual resources. The estimated construction cost for Alternative B would be about the same as A, $14.6 million.

Alternative C is composed of segments 33, 34, 36a and 36b and is the shortest of the four alternatives. Alternative C crosses less of the Southern Ute Indian Reservation. It crosses the least agricultural land, but and has a slightly higher potential to impact visual resources than Alternative B, but less than Alternative A (see Table 3-11). Alternative C parallels about 4.8 km (3 miles) of the existing 115-kv line, but potential impacts to vegetation and wildlife are greater than A or B. Alternative C crosses more fawning and calving areas than A or B. Alternative C has the lowest erosion and geologic hazards and the highest reclamation potential. C crosses more population areas (high density human component) than Alternative B. The estimated construction cost is the lowest; approximately $13.9 million.

Alternative D is composed of segments 31f, 31e, 31c, 36a and 36b, and is 17.7-20.9 km (11-13 miles) longer than the other alternatives. Alternative D would be a totally new corridor. It has the highest overall impact potential, except for human resources, of all alternatives. Due to its length and greater potential for environmental impacts, Alternative D is less desireable than the

other alternatives. The estimated construction cost is approximately $18.1 million.

Alternatives B and C have environmental advantages over Alternatives A and D. Alternative B has the least visual impact potential, crosses the least populated areas (high density human component), and has the lowest wildlife impact potential. Alternative C has the lowest erosion and geologic hazards and the best reclamation potential. Alternative C would be the least costly to construct.

The participants' preferred corridor is Alternative B. They believe more consideration should be given to visual and human resource impacts than to erosion and geologic hazards in this section. The participants have proposed Alternative B; however, use of this corridor would be totally dependent upon negotiating a right-of-way easement with the Southern Ute Indian Tribe.

3.7.2.7 Long Hollow-Durango 115-kv Transmission Line

Colorado-Ute plans to construct a single-circuit 115-kv transmission line, on double-circuit towers, from the Long Hollow 345/115-kv Substation to Colorado-Ute's existing Durango Substation (see Figure 3-13). This line is required to provide power and energy to La Plata Electric Association. Colorado-Ute proposes to route this 115-kv line in corridor segment 39. Corridor segment 39 parallels Colorado-Ute's existing Durango-Shiprock 115-kv transmission line. Corridor segment 39 is preferred because the proposed Ridges Reservoir of the Animas-La Plata Project is to be located along Basin Creek south of segment 39. A line constructed south of the proposed reservoir would be longer, cross rougher terrain and have the limited access on the south and east sides of the proposed reservoir. Another possible corridor could follow segment 32b north of Long Hollow Substation to the existing Lost Canyon to Durango 115-kv transmisison line and then parallel the existing line into the Durango Substation (see Figure 3-13). The major disadvantage with such a corridor is that much of the land along it has been developed or subdivided for development. A corridor paralleling the existing Shiprock-Durango 115-kv transmission line is the most reasonable and practical alternative.

A listing of the potential environmental impacts for this 115-kv line is found in Table 3-16.

Table 3-12

LONG HOLLOW SUBSTATION TO DURANGO SUBSTATION CORRIDOR EVALUATION (115-kV Line)

Resource Data Items	Miles[a]	Score[b]
Vegetation		
Conifer-Aspen	3.0	12.0
Pinyon-Juniper	0.0	0.0
Saltbush and Greasewood	0.0	0.0
Mountain Shrub	2.0	4.0
Sagebrush and Grassland	0.0	0.0
Barren	0.0	0.0
		16.0
Riparian (No. of Stream Crossings)		
Major Crossing	0	0.0
Perennial	2	4.0
Intermittent	6	6.0
		10.0
Erosion Hazard		
Low	1.6	1.6
Moderate	7.0	14.0
High	0.0	0.0
		15.6
Reclamation Potential		
Poor	0.0	0.0
Fair	8.6	17.2
Good	0.0	0.0
		17.2
Geologic Hazard (Potential)		
Stable	8.6	8.6
Unstable	0.0	0.0
		8.6
Wildlife		
Mule Deer and Elk Fawning and Calving Areas	8.6	17.2
Mule Deer and Elk Critical Winter Range	0.0	0.0
Bald Eagle Concentration Areas	3.2	6.4
		23.6
Land Use		
Prime Farmland	0.0	0.0
Irrigated Cropland	3.6	14.4
Nonirrigated Cropland	0.0	0.0
Commercial Forest	0.0	0.0
		14.4

Table 3-12 (continued)

Resource Data Items	Miles[a]	Score[b]
Cultural Resources		
High	8.6	34.4
Medium	0.0	0.0
Low	0.0	0.0
		34.4
Visual Resources Impact		
Low	0.0	0.0
Moderate	0.0	0.0
High	8.6	34.4
		34.4
Human Resources		
High Density	2.0	8.0
Low Density	6.6	6.6
Recreation	0.0	0.0
Non-settled	0.0	0.0
		14.6
Parallel Existing ROW		
115-kV	8.6	
230-kV Wood	0.0	
230-kV Steel	0.0	
Total Length	8.6	

[a] *Miles of resource along corridor. (Those resources where the quantitative measure is by numbers are so indicated.)*

[b] *Impact score is derived by the following formula:*
Miles (or Nos.) of Resource x Data Item Impact Values = Impact Score.

4.0 AFFECTED ENVIRONMENT

This section describes the existing physical, biological, and cultural elements as well as the socioeconomic conditions of the study area. The area in which the proposed transmission system would be constructed covers approximately the southern two-thirds of western Colorado and a small part of northwestern New Mexico. This study area, shown in the various figures of this section, includes all or part of Garfield, Delta, Mesa, Montrose, Gunnison, Ouray, San Miguel, Dolores, San Juan, Montezuma, and La Plata Counties in Colorado, and San Juan County in New Mexico.

As is stipulated in the regulations promulgated by the Council on Environmental Quality (40 CFR 1502.15), the descriptions of the environment that follow are intended to address insignificant issues only briefly, and to emphasize the issues necessary to understand the potential effects of the alternatives considered in a Draft Environmental Impact Statement. Data and analyses presented for each issue and element of concern are commensurate with the importance of the expected impact of the project on the particular environmental element. Less important material is summarized, consolidated, or referenced.

The resource maps provided in this section are a compilation of more detailed smaller scale maps for each of the various environmental elements under study. In some cases the information shown is generalized from these more specific resource maps. References shown on the resource maps are from Burns & McDonnell (1981).

4.1 Climate

Few climatic generalizations apply to the entire study area. Influenced by a complex combination of geography and meteorology, the study area experiences wide variations in climate within short distances (National Oceanic and Atmospheric Administration 1974). Rugged mountains, deep valleys and canyons, and large plateaus and mesas characterize the terrain. The Southern Rocky Mountains, which extend along the eastern portion of the study area, act as a barrier to moisture-laden air from the Gulf of Mexico; and, as a result, the precipitation that falls within the study area originates primarily from the Pacific Ocean and occurs primarily in winter. Temperatures are dependent on both the season of year and the elevation (BLM 1978c).

Similar to the variations in temperature, annual precipitation within the study area varies with topography. Mean annual precipitation ranges from 20-130 cm (8-50 inches). The higher elevations receive much of the precipitation, most of it in the form of snow. The lower elevations, located primarily in the western

and southern parts of the study area, receive the least precipitation. Seasonally, the study area's northern two-thirds receives the greatest monthly precipitation in winter and the least in summer (National Oceanic and Atmospheric Administration 1974; BLM 1978c). An exception to this seasonal pattern, however, is the southern portion of the study area, principally in New Mexico, which experiences maximum monthly precipitation in summer and minimum monthly precipitation in winter (BLM 1978a).

4.2 Topography and Geology

The study area, which is located in the Colorado Plateau and Southern Rocky Mountain provinces described by Thornbury (1965), has large variations in topography, geomorphology, and geology. These three physical elements of the study area are described below for the relevant sections of the two geomorphic provinces. These sections are shown in Figure 4-1.

4.2.1 Sections of the Geomorphic Provinces

4.2.1.1 Uinta Basin Section

The southeastern end of the Uinta Basin Section extends into the northwestern part of the study area. Both structurally and topographically a basin, the Uinta Basin is a generally east-west trending asymetrical syncline (Thornbury 1965). That portion of the Uinta Basin in the study area is characterized by rugged topography in the highland areas and the broad, alluvial valleys of the Colorado and Gunnison Rivers in the lowlands.

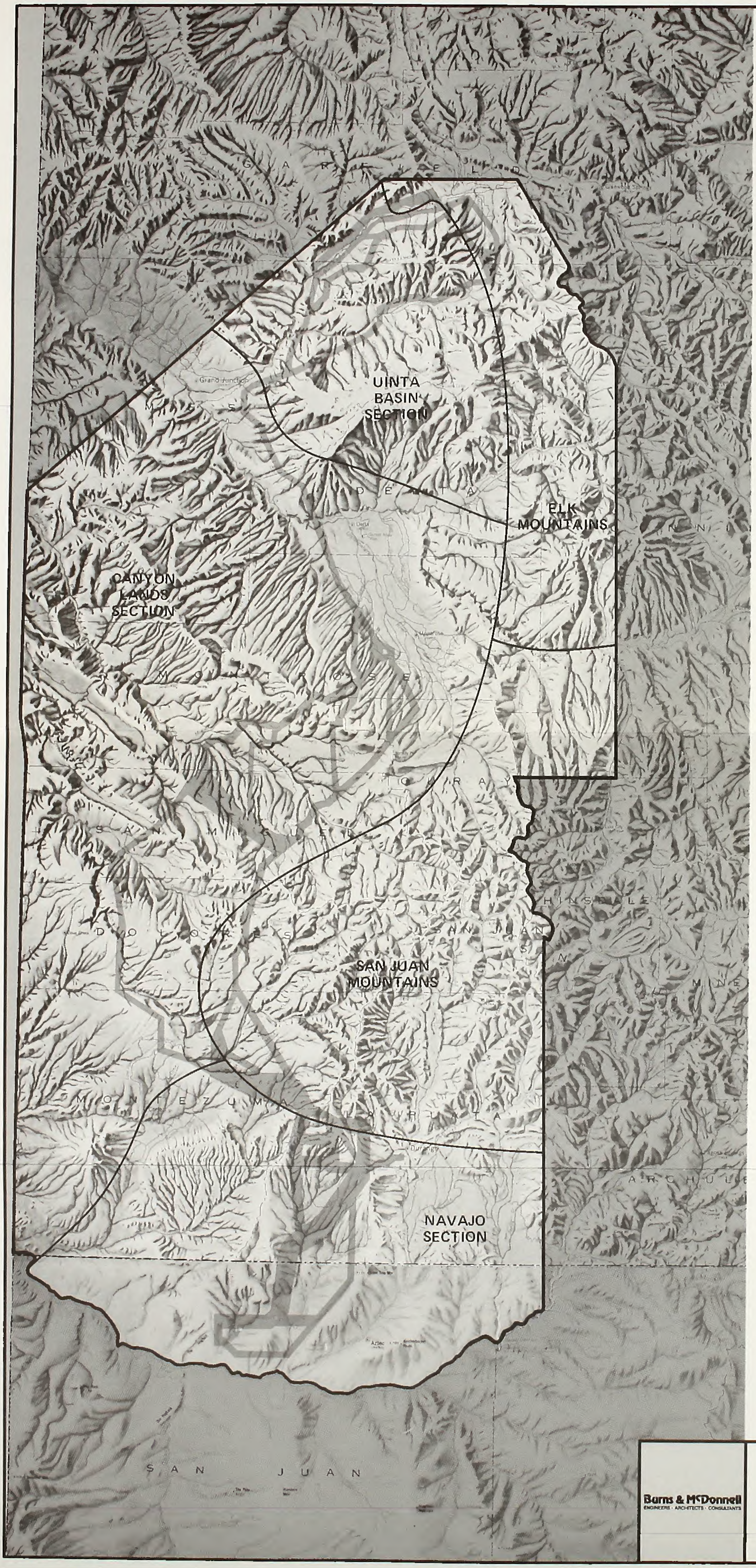
4.2.1.2 Canyon Lands Section

In Colorado, the Canyon Lands Section is bounded on the north by the Book Cliffs, on the south by the San Juan River, and on the east by the San Juan and other mountains of the Southern Rockies. Canyons are numerous and extensive in this section, although the broad, nearly flat interstream tracts in southwestern Colorado are so extensive that canyons are of secondary importance here. The section has experienced broad uplifting and has had superimposed on it a number of structural features that are strongly reflected in its topography. These structures are defined by hogbacks, homoclinal ridges, and cuestas composed primarily of Paleozoic and Mesozoic sandstones and limestones (Thornbury 1965).

4.2.1.3 Navajo Section

Comprising the southern quarter of the study area and lying southeast of the Canyon Lands Section, the Navajo Section is nearly as high as the Canyon Lands Section but not as deeply dissected. Valleys here are more commonly broad and open than canyon-like. Dry washes are numerous and rivers are rarely deeply

COLOUTE 78-069-4-002, EIS, RIFLE-SAN JUAN TRANS. LINE



N

Scale: 1:1,000,000
1 Inch Equals Approx. 16 Miles

LEGEND

STUOY AREA BOUNOARY

CORRIOOR NETWORK

Sources of Information:

U.S. Geological Survey
Rocky Mountain Association of Geologists 1972
Hunt 1974
Fenneman 1931

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Figure 4-1
RELIEF MAP OF
THE PROJECT AREA

incised. The rocks of this section have not been deformed as much as in adjacent areas; hence mesas, buttes, cuestas, and rock terraces are more common than hogbacks and homoclinal ridges (Thornbury 1965).

4.2.1.4 Elk Mountains Section

The Elk and West Elk Mountains, comprising the northeastern border of the study area, can be considered as westward continuations of the Sawatch Range. Structurally, however, they are not faulted anticlines like most of the other ranges in Colorado, but are composed of a series of layers of Paleozoic sediments thrust westward over one another. These rocks, often crumpled and highly metamorphosed, are cut by numerous sills, dikes, and other intrusions, many of which have caused mineral enrichment locally (Chronic and Chronic 1972).

4.2.1.5 San Juan Mountains Section

The San Juan Mountains, located in the east and east-central portion of the study area, are composed predominantly of Tertiary volcanic rocks; older bodies of Precambrian, Paleozoic, and Mesozoic rock are also exposed. A broad domal uplift, the San Juan Mountains cover about 15,000 square kilometers (5,790 square miles) (King 1977). Numerous peaks attain altitudes in excess of 3,960 m (13,000 feet), and the highest peak, Uncompahgre Peak, exceeds 4,270 m (14,000 feet) altitude. These mountains are also noted for their striking forms such as landslides, rock streams, and rock glaciers.

4.2.2 Major Geologic Structures

The major geologic structures of the study area are shown in Figure 4-2, which presents these structures as tectonic units. As used for this figure, a tectonic unit may be generally defined as a spatially large structural feature produced by the deformation of the earth's crust. Also, these larger features can include smaller geologic structures--such as faults, folds, and joints--which may have been caused by tectonic forces. Significant tectonic units of the study area include, for example, the Uncompahgre Uplift and the Paradox Basin.

4.2.3 Geologic Hazard Potential

Landslide deposit maps (U.S.G.S. 1° x 2° quadrangles, 1975) supported with surface geology maps of Colorado and New Mexico were used to determine potentially hazardous areas. Areas designated as being unstable are inferred to be underlain by landslide deposits resulting from landsliding, avalanching, block gliding, debris sliding or flowing, mudflows, rock sliding, rockfalls, slumping and talus accumulation. Rock glacier deposits,

colluvium and solifluction deposits are also included in this category. Areas which are not underlain by these deposits were considered stable. Geologic hazard areas were mapped and included in the profiles of the corridors to promote comparisons (see Section 4.12).

4.3 Seismicity

The study area is located in a Zone 1 risk area as noted on Figure 4-3. The determination of this seismic risk zone is based on historic records of earthquakes, their intensities, evidence of strain release, and distribution of geologic structures related to earthquake activity. The frequency of possible earthquakes is not considered.

Zone 1 includes those areas where the most frequently measured earthquake intensities are V and VI on the Modified Mercalli (MM) Intensity Scale of 1931 (Wood and Neumann 1931). Such earthquakes produce only minor damage. The MM Scale is a measure of the destructive capacity of an earthquake or the effects of the shock as observed by people (Burns & McDonnell 1981)

The Coast and Geodetic Survey has analyzed certain earthquake recurrence relationships, resulting in frequency estimates for earthquake occurrence in certain generalized areas of the United States (Algermissen 1969). From this analysis, the general area which includes the study area should be expected to experience, per 100 years, 182 V-level, 38 VI-level, 7.9 VII-level, and 1.7 VIII-level earthquakes.

A search of the Earthquake Data File was requested from the National Geophysical and Solar-Terrestrial Data Center at Boulder, Colorado. Kirkham and Roger's Earthquake Potential in Colorado was also reviewed. There were 84 recorded shocks with epicenters located within the approximate boundaries of the study area in a 64-year period from 1913 to 1977. The greatest intensity recorded was VII on the Modified Mercalli Intensity Scale, and was located close to the Colorado-New Mexico state line. The epicenter of this and other earthquakes which have occurred in the study area between 1870 and 1975 are shown in Figure 4-3. Faulted areas which may be associated with seismic activity are also shown in this figure.

4.4 Soils

The soils of the study area are indicative of the area's complex and interrelated climate, topography, geology, and vegetation. The soils have a complex distribution and exhibit considerable variety. Generalized soil bodies of the study area (referred to

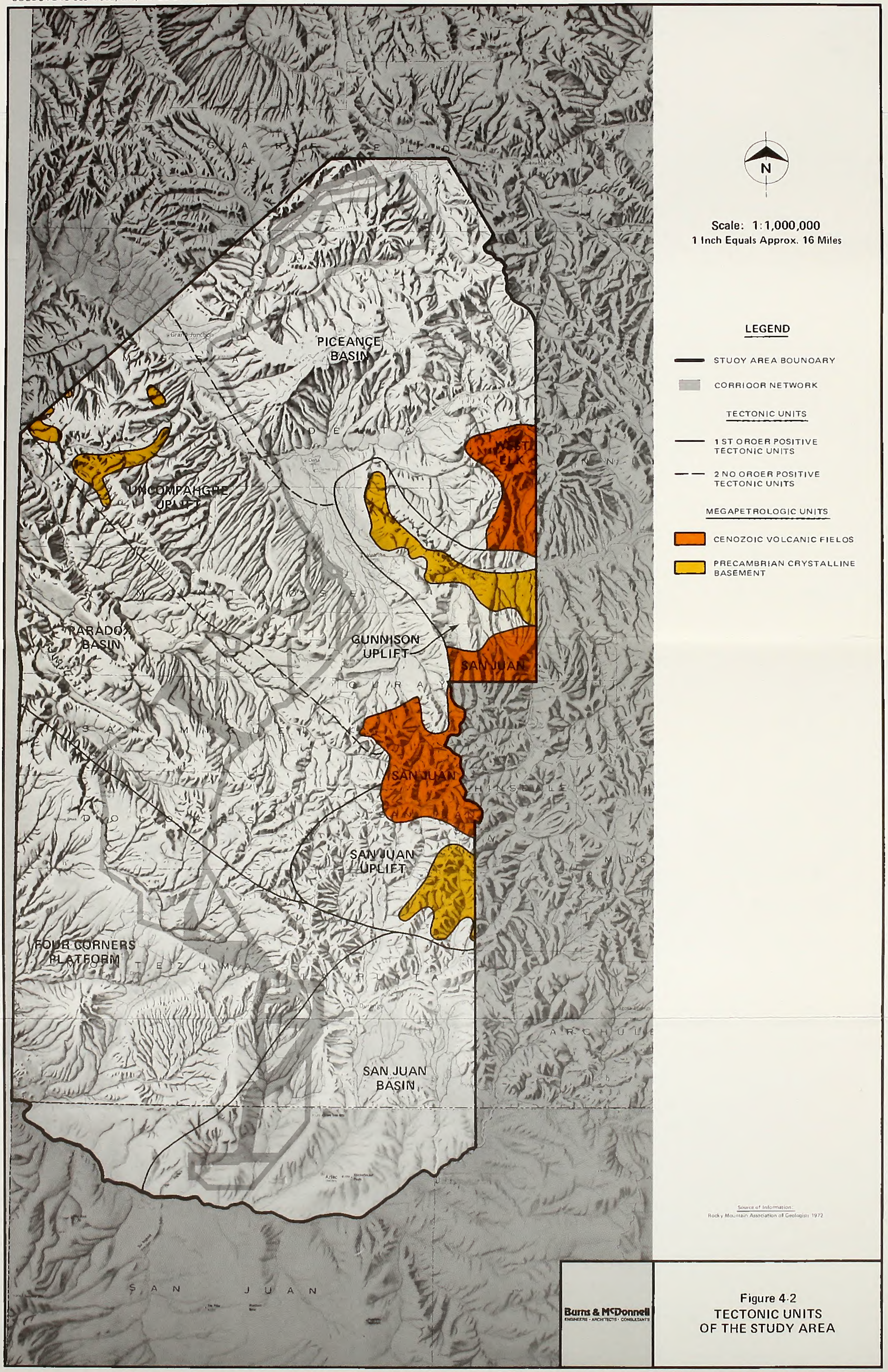

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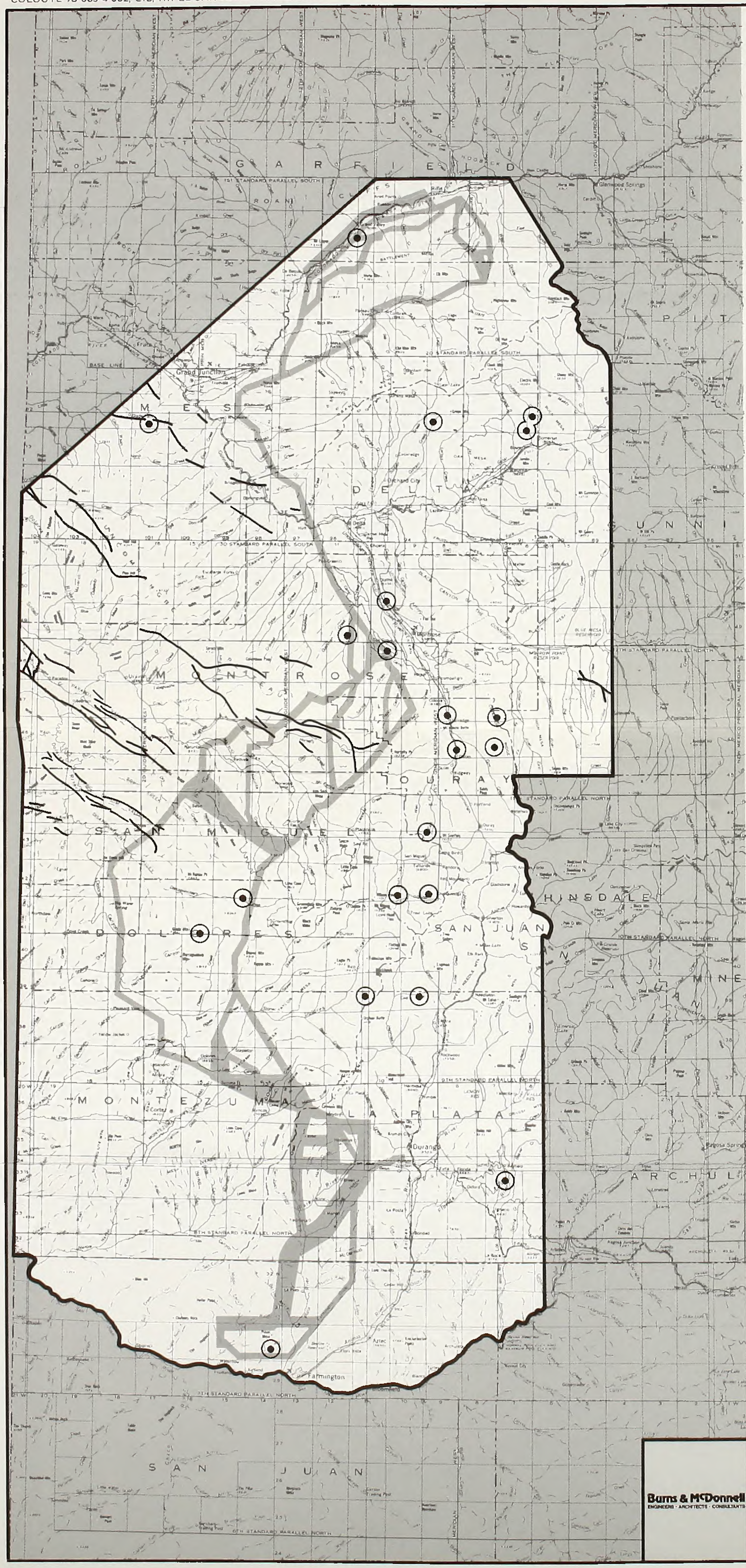
Figure 4-2
TECTONIC UNITS
OF THE STUDY AREA



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Scale: 1:1,000,000
1 Inch Equals Approx. 16 Miles

LEGEND

STUOY AREA BOUNDARY

CORRIDOR NETWORK

EPICENTER*

FAULTEO AREA**

*AS REPORTEO BY THE NATIONAL GEOPHYSICAL AND SOLAR-TERRESTRIAL OATA CENTER (NOAA), BOULDER, COLORADO.

** FROM: "EARTHOUAKE POTENTIAL IN COLORAOO: A PRELIMINARY EVALUATION", BY R. M. KIRKHAM, ANO W. P. ROGERS, COLORADO GEOLOGICAL SURVEY, 1978.

NOTE: THE ENTIRE STATE OF COLORADO, ANO THE MAJORITY OF NEW MEXICO HAS BEEN OESIGNATED AS SEISMIC RISK ZONE 1. ZONE 1 IS THAT AREA WHERE EARTHOUAKES ARE EXPECTEO TO PROOUCE ONLY MINOR OAMAGE. THIS INFORMATION WAS OBTAINED FROM "SEISMIC RISK STUOIES IN THE UNITED STATES", S.T. ALGERMISSEN, NATIONAL OCEANIC ANO ATMOSPHERIC ADMINISTRATION, 1969.

Sources of Information:
Kirkham and Rogers 1978
NOAA 1974

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Figure 4-3
SEISMIC HISTORY
AND FAULTED AREAS

here as map units, Heil et al. 1977) are shown on Figure 4-4. Each of these map units represents one or more different categories of soils. Listed in Table 4-1, these categories follow the soil taxonomy nomenclature developed by the Soil Conservation Service (SCS) of the U.S. Department of Agriculture.

Table 4-1 also presents a comparative evaluation of three basic properties of the soils within each map unit (i.e., construction and maintenance limitations, erosion hazard, and reclamation potential). The ratings assigned to these properties are based on information compiled by Heil et al. (1977), SCS publications, and related documents (SCS 1955, 1967, 1978a, 1978b; Maker et al. 1973).

The construction and maintenance limitations of the soils of each map unit are evaluated as having one of three ratings: slight, moderate, or major. The specific engineering properties considered under this broad category include depth to bedrock, shrink-swell potential, frost action potential, slope, permeability, corrosivity, bearing capacity, and sheer strength.

The soil erosion hazard of each map unit is evaluated as being low, moderate, or high. This assessment is made based on such criteria as mean annual precipitation, elevation, slope, soil texture (e.g., sandy, loamy, clayey), and vegetative cover.

A soil's reclamation potential is evaluated as being good, fair, or poor. The criteria used to make this evaluation includes mean annual precipitation, mean annual soil temperature, length of frost-free season, soil depth, moisture retention capacity, and vegetative cover.

4.5 Hydrology

Portions of four major drainage basins exist in the study area: the Gunnison River Basin, the Dolores-San Miguel River Basin, the San Juan River Basin, and the Upper Colorado River Basin.

4.5.1 Gunnison River Basin

Snowmelt from high mountain areas provides the principal water supply for the Gunnison River Basin. A portion of the Gunnison River through the Black Canyon has been recommended for inclusion in the National Wild and Scenic River System (see Section 4.10.5). Above the Black Canyon, the Gunnison River is used to generate electric power, and the Gunnison Tunnel located near the hydroelectric facility delivers irrigation water to the Uncompahgre Valley. Also, water from the Gunnison is used for municipal and industrial purposes.

Table 4-1
SOILS OF THE STUDY AREA

Map Unit No.	Map Unit	Construction and Maintenance Limitations	Erosion Hazard	Reclamation Potential
1.	TYPIC CRYOBORALF, skeletal-ROCK OUTCROP: Sloping to steep	Moderate	Moderate	Fair
2.	TYPIC EUTROBORALFS, clayey-ROCK OUTCROP: Steep	Moderate	Moderate	Fair
3.	TYPIC HAPLARGIDS: Loamy; nearly level and gently sloping	Slight	Low	Good
4.	USTOLLIC HAPLARGIDS: Loamy; nearly level and gently sloping	Slight	Low	Good
5.	USTOLLIC HAPLARGIDS, loamy-ROCK OUTCROP: Gently sloping to steep	Moderate	Moderate	Fair
6.	USTOLLIC HAPLARGIDS, silty-USTOLLIC HAPLARGIDS: loamy-USTIC TORRIORTHENTS silty: Nearly level to sloping	Slight	Low	Fair
7.	USTOLLIC HAPLARGIDS-USTERIC CAMBORTHIDS: Clayey; gently sloping and sloping	Moderate	Moderate	Fair
8.	USTOLLIC NATRARGIDS, clayey-USTOLLIC HAPLARGIDS, loamy: Nearly level to sloping	Moderate	Moderate	Poor
9.	TYPIC CALCIORTHIDS, skeletal-USTIC TORRIORTHENTS, loamy: Gently sloping to moderately steep	Slight	Low	Poor
10.	LITHIC CAMBORTHIDS-LITHIC USTIC TORRIORTHENTS: Loamy; steep	Moderate	Moderate	Fair
11.	TYPIC TORRIFLUVENTS: Silty; nearly level	Major	Low	Good
12.	USTIC TORRIFLUVENTS, loamy-TYPIC FLUVAQUENTS, clayey: Nearly level and gently sloping	Moderate	Moderate	Fair
13.	USTIC TORRIFLUVENTS: Loamy; nearly level and gently sloping	Major	High	Fair
14.	TYPIC TORRIORTHENTS (shallow): Clayey; gently sloping to steep	Major	Moderate	Fair
15.	LITHIC USTIC TORRIORTHENTS, loamy-ROCK OUTCROP: Gently sloping to steep	Moderate	Moderate	Fair

Table 4-1
SOILS OF THE STUDY AREA
(Continued)

Map Unit No.	Map Unit	Construction and Maintenance Limitations	Erosion Hazard	Reclamation Potential
16.	PERGELIC CRYUMBREPTS, skeletal-PERGELIC CRYOCHREPTS, skeletal-ROCK OUTCROP: Sloping to steep	Moderate	Moderate	Poor
17.	ARIDIC ARGIBOROLLS-ARIDIC HAPLOBOROLLS: Clayey; gently sloping to steep	Moderate	Moderate	Fair
18.	TYPIC CRYOBOROLLS, loamy-ROCK OUTCROP: Sloping to steep	Moderate	Moderate	Fair
19.	TYPIC CRYOBOROLLS, clayey-TYPIC CRYOBORALFS, skeletal; moderately steep and steep	Moderate	Moderate	Fair
20.	TYPIC CRYOBOROLLS-TYPIC CRYORTHENTS: Clayey; sloping to steep	Major	Moderate	Fair
21.	ARGIC CRYOBOROLLS-TYPIC CRYOBOROLLS: Loamy; gently sloping to steep	Moderate	Moderate	Fair
22.	ARIDIC HAPLOBOROLLS, loamy-TORRIORTHENTIC HAPLOBOROLLS, loamy-ARDIC ARGIBOROLLS, clayey: Gently sloping to steep	Moderate	Moderate	Good
23.	ARIDIC ARGIUSTOLLS-ARIDIC HAPLOBOROLLS: Clayey; sloping to steep	Major	High	Poor
24.	AQUIC USTIFLUVENT-TYPIC TORRIORTHENTS Loamy; nearly level and gently sloping	Moderate	Moderate	Fair

Further information concerning the Gunnison River Basin is available in the Final Environmental Statement for the Gunnison River Wild and Scenic River Study prepared by the National Park Service (NPS 1979b).

Groundwater in the basin is generally scarce; where available for use, it often contains high concentrations of dissolved solids. Very little information on groundwater use currently exists. It has been estimated that groundwater use represents less than one percent of the basin's total water consumption (NPS 1979b).

4.5.2 Dolores and San Miguel River Basin

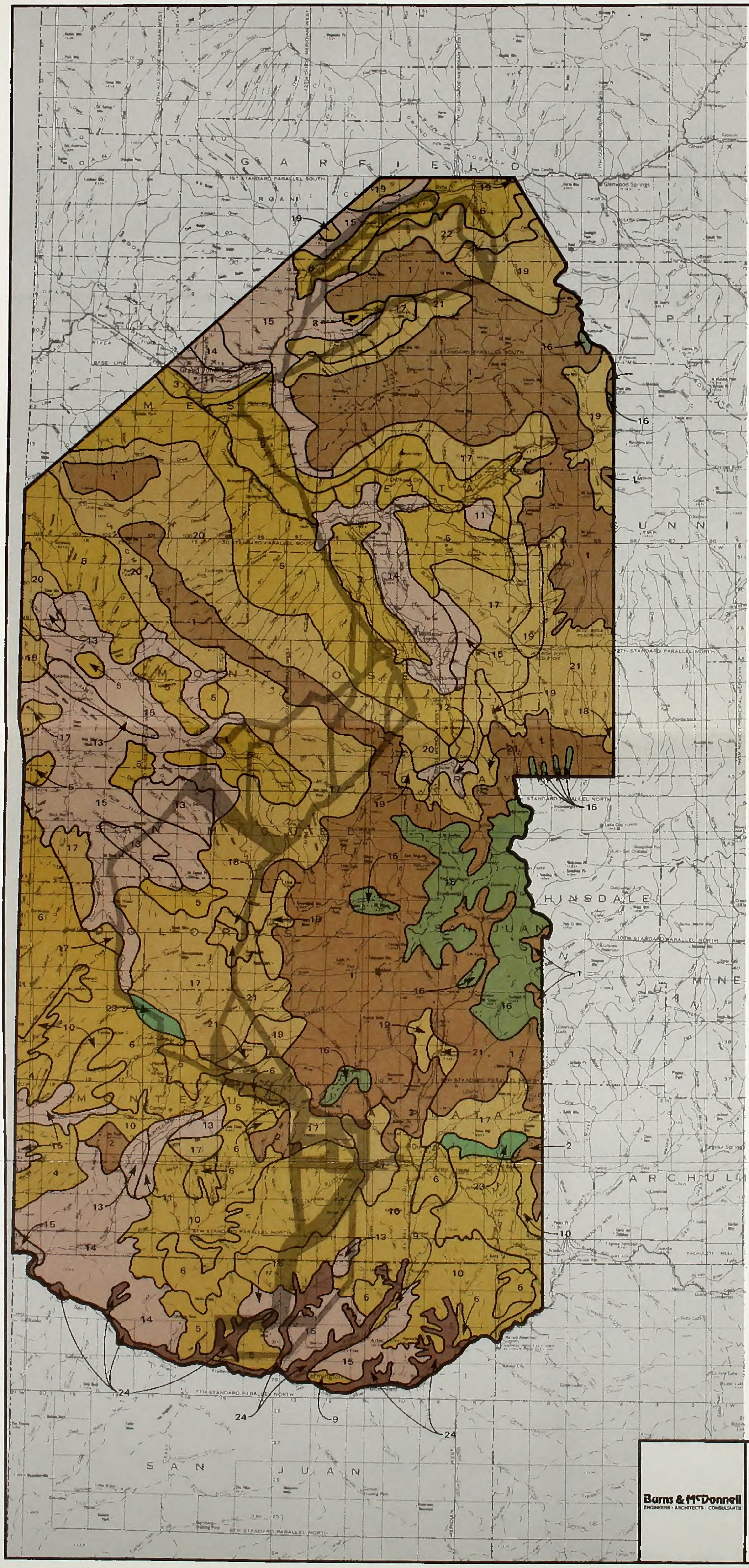
Originating in the San Juan Mountains, the Dolores River and its largest tributary, the San Miguel River, exhibit large seasonal fluctuations characteristic of streams in southwestern Colorado. The natural flows of the Dolores River will be altered with the construction of the McPhee Dam near Dolores, Colorado. This is part of the Bureau of Reclamation's Dolores Project and is scheduled to be completed in August of 1984.

Portions of the Dolores River have been recommended for inclusion in the National Wild and Scenic River System (see Section 4.10.5).

Additional information concerning the Dolores and San Miguel River Basins can be found in the Final Environmental Statements prepared by the Water and Power Resources Service (now the Bureau of Reclamation) for the Dolores Project and for the Colorado River Salinity Control Project, Paradox Valley Unit; and the Final Environmental Statement for the Dolores River, Colorado: Wild and Scenic River Study prepared by the FS (Water and Power Resources Service 1977a, 1979b; FS 1976). Groundwater in the Dolores-San Miguel River Basin is very limited (Water and Power Resources Service 1977a).

4.5.3 San Juan River Basin

The San Juan River originates northeast of Pagosa Springs, Colorado in the San Juan Mountains, and flows south and west through southwest Colorado and northwest New Mexico. The San Juan River and its three major tributaries (the Animas, La Plata, and Mancos Rivers) have extreme seasonal fluctuations in flow under natural conditions. The natural flows, however, have been modified by the construction of several reservoirs and may be further modified following the completion of the Animas-La Plata Project. Further information on the San Juan River Basin is available in the Final Environmental Statement prepared by the Water and Power Resources Service for the Animas-La Plata Project



N

Scale: 1:1,000,000
1 Inch Equals Approx. 16 Miles

LEGEND

STUDY AREA BOUNDARY

CORRIDOR NETWORK

1 TYPIC CRYOBORALF – rock outcrop

2 TYPIC EUTROBORALF – clayey-rock outcrop

3 TYPIC HAPLARGID – loamy

4 USTOLLIC HAPLARGID – loamy

5 USTOLLIC HAPLARGID – loamy-rock outcrop

6 USTOLLIC HAPLARGID – silty

7 USTOLLIC HAPLARGID – USTERIC CAMBORTHID – clayey

8 USTOLLIC NATRARGID – clayey; USTOLLIC HAPLARGID – loamy

9 TYPIC CALCIORTHIDS – skeletal; USTIC TORRIORTHENT – loamy

10 LITHIC CAMBORTHID – LITHIC USTIC TORRIORTHENT – loamy

11 TYPIC TORRIFLUVENT – silty

12 USTIC TORRIFLUVENT – loamy; TYPIC FLUVAQUENT clayey

13 USTIC TORRIFLUVENT – loamy

14 TYPIC TORRIORTHENT – clayey

15 LITHIC USTIC TORRIORTHENT – loamy-rock outcrop

16 PERGELIC CRYUMBREPT – skeletal; PERGELIC CRYOCHREPT – skeletal-rock outcrop

17 ARIDIC ARGIBOROLL – ARIDIC HAPLOBOROLL – clayey

18 TYPIC CRYOBOROLL – loamy-rock outcrop

19 TYPIC CRYOBOROLL – clayey; TYPIC CRYOBORALF – skeletal

20 TYPIC CRYOBOROLL – TYPIC CRYORTHENTS – clayey

21 ARGIC CRYOBOROLL – TYPIC CRYOBOROLL – loamy

22 ARIDIC HAPLOBOROLL – loamy; TORRIORTHENTIC HAPLOBOROLL – loamy; ARIDIC ARGIBOROLL – clayey

23 ARIDIC ARGIUSTOLL – ARIDIC HAPLOBOROLL – clayey

24 AQUIC USTIFLUVENT – TYPIC TORRIORTHENT – loamy-calcareous

Sources of Information:

Heil et al. 1977
Maker et al. 1973

Burns & McDonnell
ENGINEERS · ARCHITECTS · CONSULTANTS

Figure 4-4
SOILS IN THE STUDY AREA

and the draft of the Star Lake-Bisti Regional Coal Environmental Statement prepared by the BLM (Water and Power Resources Service 1979a; BLM 1978a).

Groundwater is limited in the San Juan Basin and is used primarily for domestic water. Supplies are generally not sufficient for use as irrigation water or for other large-scale uses (Water and Power Resources Service 1979a).

4.5.4 Upper Colorado River Basin

The Colorado River is the largest in Colorado, and was recently studied by the NPS for inclusion in the National Wild and Scenic River System. In general, the natural flows in the Colorado River are extremely variable. However, storage projects on the upper Colorado and many of the tributaries affect these natural flows. Currently the flow of the river and its tributaries are apportioned by a compact between the states along the Upper and Lower Colorado River Basin.

Further information concerning the Upper Colorado River Basin is available in the Draft Environmental Statement for the Colorado and Lower Dolores Wild and Scenic Rivers (NPS 1979a).

Groundwater occurs under all of the area. However, the yields of wells are generally small and the quality of the water is poor. The current and probable future use of groundwater from the area is small compared to the use of surface water (NPS 1979a).

4.6 Vegetation

4.6.1 Vegetative Communities

The study area consists of a variety of vegetative communities which result, in part, from changes in elevation and precipitation (Oosting 1956). The general distribution of major plant communities found within the study area is shown in Figure 4-5 and is described below. Descriptions of the vegetative communities were incorporated from Oosting (1956), BLM (1978c), Public Service Company of New Mexico (PSNM) (1978), and Odum (1971). Refer to Appendix D of Burns & McDonnell (1981) for scientific names and a more complete listing of plant species within the study area.

4.6.1.1 Pinon-Juniper Community

The pinon-juniper vegetative community is located in the foothills and mesa areas of southwest Colorado and northern New Mexico. The pinon-juniper community is usually found where annual precipitation ranges from 25-40 cm (10-16 inches) and at elevations from 1,890-2,256 m (6,200-7,400 feet). In Colorado,

the major overstory plants of this community are Colorado pinon pine and Utah juniper. In New Mexico, the major overstory plants are Colorado pinon pine and one-seed juniper. Grasses such as bottlebrush squirreltail, Indian ricegrass, and needle-and-thread grass generally dominate the understory in Colorado. In New Mexico, the dominant understory is blue grama and galleta grass. Open sagebrush areas consisting of big sagebrush, black sagebrush, and rabbitbrush are often interspersed with the pinon-juniper community.

4.6.1.2 Saltbush Community

The saltbush community in western Colorado and New Mexico includes several species of saltbush and is typically located between the pinon-juniper vegetative community and irrigated croplands found along river valleys. Saltbush exists in areas where annual precipitation averages less than 25 cm (10 inches). The dominant species include shadscale, mat saltbush, Gardner saltbush, and in New Mexico, the four-wing saltbush. Prevalent grasses are galleta, blue grama, and bottlebrush squirreltail. Rabbitbrush and broom snakeweed also occur.

4.6.1.3 Mountain Shrub Community

The mountain shrub community includes untimbered lands where shrubs other than sagebrush and rabbitbrush predominate. It generally occurs in areas with 36-46 cm (14-18 inches) of annual precipitation, at elevations from about 1,829-2,743 m (6,000-9,000 feet). The major overstory species are Gambel oak, common serviceberry, and mountain mahogany. The understory consists of bluegrass, smooth brome, and arrowleaf balsamroot.

4.6.1.4 Sagebrush Community

The sagebrush community is usually found adjacent to the pinon-juniper communities in similar elevation and precipitation zones. Big sagebrush and black sagebrush are the dominant species with rabbitbrush occurring with less frequency. Other species include blue grama, galleta grass, bottlebrush squirreltail, bluegrass, Indian ricegrass, cheatgrass, globemallow, prickly pear, western wheatgrass, and Thurber's fescue.

4.6.1.5 Conifer-Aspen Community

The conifer-aspen community is found at the higher range elevations from 1,829-3,353 m (6,000-11,000 feet), which receive 51 cm (20 inches) or more of precipitation annually. Douglas fir,

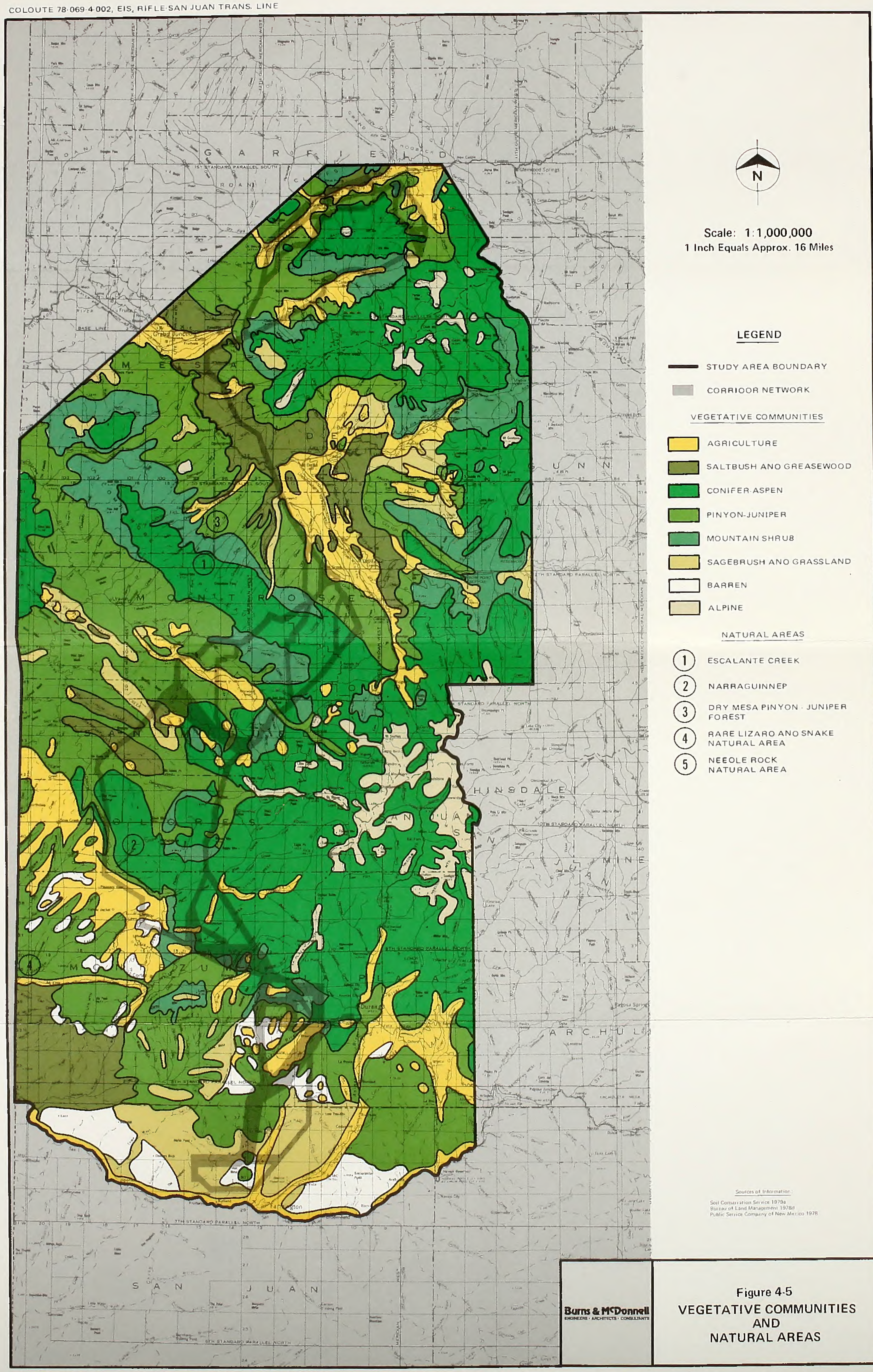


Figure 4-5
VEGETATIVE COMMUNITIES
AND
NATURAL AREAS

subalpine fir, blue spruce, Engelmann spruce, ponderosa pine, and aspen are the major overstory species. Understory species include fescue, junegrass, western yarrow, bluegrass, and alpine timothy.

4.6.1.6 Barren Areas

Barren areas are nearly devoid of vegetation due to overgrazing, mining, erosion, or poor moisture and soil conditions. Vegetative species present are typical of disturbed or poor soil conditions. Saltbush, alkali sacaton, ring muhly, and rice grass often occur.

4.6.1.7 Greasewood and Halfshrub Community

The greasewood and halfshrub vegetative community includes disturbed areas below 1,890 m (6,200 feet) where vegetation has not been totally depleted or has begun to recover. Disturbed areas are often sheep and cattleholding areas or the result of mineral exploration.

Major plants representing this community are black greasewood, alkali sacaton, broom snakeweed, and wild daisy. Other plants common to this community include sagebrush, saltgrass, saltbush, foxtail barley, cocklebur, ragweed, and Russian thistle.

4.6.1.8 Riparian and Broadleaf Tree Community

The broadleaf vegetative community, which can occur in riparian habitat, is located mainly along higher elevation drainages and lower elevation perennial streams. Major riparian tree species in the Uncompahgre Basin area of Colorado are quaking aspen and cottonwood. Conifers are often interspersed with aspens in this community. In southern Dolores and Montezuma Counties of Colorado, dominant riparian species are cottonwood and box elder interspersed with dense growths of willow, alder, and hawthorn. A variety of forbs and shrubs make up the understory.

4.6.1.9 Grasslands

Grassland communities, which are sometimes small and scattered, include mountain meadows in the midwestern counties of Colorado and semidesert grasslands in the southwestern counties. The actual plant composition can vary considerably but usually includes Arizona fescue, junegrass, western yarrow, subalpine needlegrass, tufted hairgrass, and invader species such as cocklebur, Russian thistle, and koshia.

4.6.1.10 Agricultural Lands

Agricultural lands include land used for crops, pasture, or grazing. In addition, this category includes the woodlands and wastelands owned or rented by agricultural landowners.

Major agricultural lands are found along the Uncompahgre River, the North Fork of the Gunnison and in other areas of the Colorado River Basin. Irrigated croplands are common in the Montezuma Valley area with smaller irrigated areas located along the Dolores River. The major agricultural uses of the land are for alfalfa, meadow hay, and pasture. Dry croplands, with occasional scattered islands of pinon-juniper woodland, exist between elevations of 1,981-2,286 m (6,500-7,500 feet) in northwestern Montezuma County and western Dolores County.

4.6.1.11 Alpine Community

Alpine areas are scattered throughout southwest Colorado at or above the timber line. The alpine areas have no characteristic dominant plant species but include several tree species and many species of grasses, sedges, and forbs. Plant species predominating in the alpine areas include alpine avens, alpine bluegrass, American bistort, aspen sunflower, Engelmann spruce, subalpine fir, rushes, and sedges.

4.6.2 Threatened and Endangered Species

The U.S. Fish and Wildlife Service (USFWS) advised the REA of three plant species which could possibly be found within the study area that are designated "threatened" or "endangered". The spineless hedgehog cactus is designated as endangered, while the Uinta Basin hookless cactus and the Mesa Verde cactus are designated as threatened.

The Colorado Native Plant Society and the Colorado and New Mexico National Heritage Programs have developed lists of the plants they consider to be endangered within their respective states. The purpose of these lists is to identify plants for which there is concern within the states and establish a base for individual and public support of efforts to preserve threatened and endangered plant species. Although there is no legislated protection for state endangered plants, they were considered during the corridor selection process. State listed species can be found in Appendix H.

The spineless hedgehog cactus (*Echinocereus triglochidiatus var. inermis*) received federal designation as endangered on November 7, 1979 (USFWS 1979c). The plant occurs at elevations of 1,524-2,438 m (5,000-8,000 feet) and is primarily found in shaded areas beneath pinon pines. It may also be infrequently found with sagebrush on cool exposures. The species has been commercially exploited and is susceptible to grazing and trampling by livestock.

The "threatened" designation was given to the Uinta Basin hookless cactus (Sclerocactus glaucus) on October 11, 1979 (USFWS 1979d). The preferred habitat for this species is rocky and dry alkaline hills at elevations around 1,524 m (5,000 feet). The cactus is often associated with shadscale, galleta grass, and Ephedra. Commercial exploitation and trampling by livestock are considered to be the major threats to existing populations.

Mesa Verde cactus (Sclerocactus mesae-verdae) was designated a threatened species on October 30, 1979 (USFW 1979b). The species is found on dry clay soils at elevations of 1,220-1,524 m (4,000-5,000 feet). It may occur singly or in clusters. Commercial exploitation is the greatest threat to existing populations, and the species does not thrive under cultivation.

The USFWS has not published critical habitat for the above species as each is threatened by commercial exploitation, and it is felt that publishing the location of areas in which these species are found could result in further harm to existing populations. Areas where these species are likely to be found within the study area were located on maps; however, at the request of the USFWS, these areas are not shown in this report.

4.7 Wildlife

Information regarding wildlife resources was collected from a variety of sources including the USFWS, Colorado Division of Wildlife (CDOW), Bureau of Reclamation (formerly Water and Power Resources Service), BLM, and the FS. The following section discusses representative species within the study area. Appendix D of Burns & McDonnell (1981) includes a more comprehensive listing with common and scientific names.

4.7.1 Mammals

4.7.1.1 Large Mammals

Large mammals occurring in the study area include mule deer, elk, bighorn sheep, pronghorn antelope, mountain goat, mountain lion, black bear, and wild horses. Figure 4-6 gives the known distribution or range within the study area for many of these species.

Mule Deer: Mule deer are widely distributed and common throughout the study area (Bissell 1978), particularly during the summer months. During the late fall and winter, heavy snows at upper elevations force the deer to lower elevations where food is available. Winter range normally occurs at elevations below 2,134 m (7,000 feet) and can be found throughout the study area, including the region within New Mexico. Since the turn of the

century, much of the winter range utilized by mule deer has been converted to farmland and other uses. Figure 4-6 shows those areas that are considered as critical winter habitat by the CDOW and the New Mexico Department of Game and Fish. The spring-fall migration routes are generally found at elevations from 1,981-2,438 m (6,500-8,000 feet). Mule deer fall migration generally occurs between late October and late December, while spring migration usually occurs from April through July (CDOW 1981a). The spring migration routes often serve as fawning grounds as deer move up from their winter range. The majority of fawning typically occurs during the month of June (The Wildlife Management Institute 1978). Mule deer habitat generally includes conifer forest, desert shrubs, chaparral, and grasslands with shrubs.

Elk: Elk are also widely distributed throughout the study area, primarily in Colorado (Bissell 1978). Elk are less common in the New Mexico portion of the study area (New Mexico Department of Game and Fish 1980b). The elk summer range coincides with that of mule deer (2,377-4,267 m; 7,800-14,000 feet) although elk band together more than deer. Summer range usually consists of a variety of areas with high altitude grasses, sedges, willows, and forbs. Elk generally winter at elevations between 1,981-2,926 m (6,500-9,600 feet) in riparian, pinon-juniper, and mountain shrub areas. The spring-fall range (2,286-2,438 m; 7,500-8,000 feet) includes the lower portion of its summer range and the upper portion of its winter range. The important calving areas include aspen woodlands at 2,438-3,048 m (8,000-10,000 feet) with a northeast aspect. Calving generally occurs between May 20 and June 15. Elk migration generally occurs between November 1 and December 31, while spring migration generally occurs between April and June (CDOW 1981a). Burt and Grossenheider (1976) report elk habitat to include semi-open forest, mountain meadows, foothills, and valleys.

Wild Horses: Wild horses are known to occur in the study area. Two herds located in the central portion of the study area (Figure 4-6) are known as the Naturita Dry Creek Herd (20 head) and the Spring Creek Basin Herd (75 head) (BLM 1980a). Horses in the Spring Creek Basin Herd tend to band together in groups of up to 10-12 animals. Some minor banding has been observed in the Naturita Dry Creek Herd. Another important wild horse area is the Little Book Cliff Wild Horse Area, which is located north of Grand Junction, Colorado (BLM 1981b). At present no distinct seasonal use areas have been identified. The horses' movements are related to forage, water supply, hunting pressure, and weather.

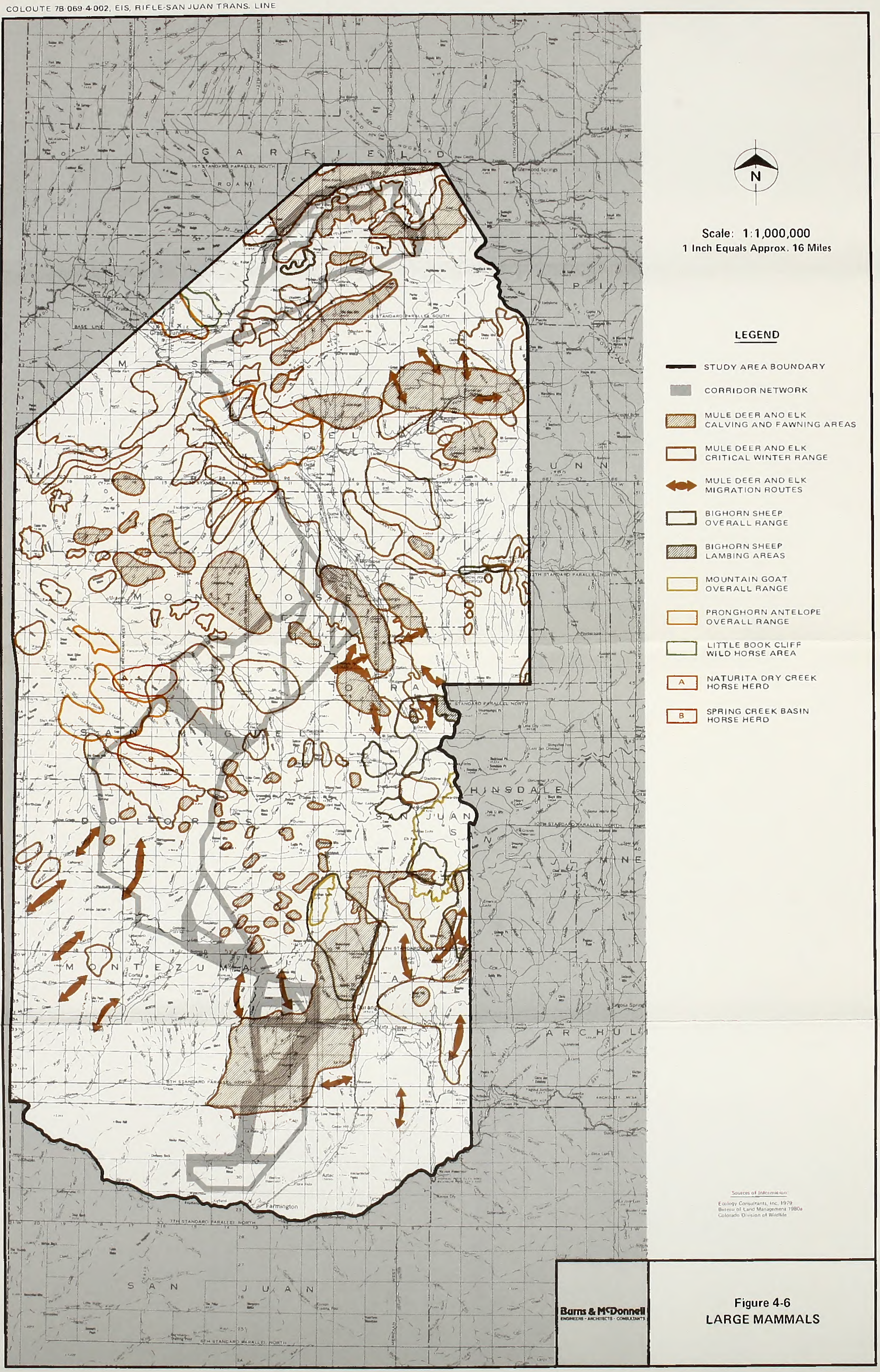


Figure 4-6
LARGE MAMMALS

Bighorn Sheep: Bighorn sheep are less common than deer and elk and are found at only a few restricted sites within the study area. The CDOW reported breeding populations in the northern and eastern mountainous regions of the study area, as shown in Figure 4-6 (Bissell 1978).

Pronghorn Antelope: Pronghorn antelope are found in highly limited ranges within the study area (Figure 4-6). The CDOW classifies antelope as common, with scattered herds reported throughout southwest Colorado (Bissell 1978). A sustaining herd of 180-200 head ranges from Delta to Kannah Creek between the Gunnison River and the Grand Mesa, although limited habitat prevents the herd from expanding (CDOW 1983). An antelope kidding area is located south of Kannah Creek. Remnant herds of unknown size are reported in northern New Mexico (Whitford 1978).

Mountain Goat: The mountain goat's range within the study area is highly limited (Figure 4-6). During the summer, goats are usually found above the timberline, while in the winter they move to lower elevations. Their preferred habitat includes steep slopes and benches along cliffs (Burt and Grossenheider 1976). The CDOW classifies mountain goats as rare in southwest Colorado (Bissell 1978).

Mountain Lion: The mountain lion ranges through most of the study area, although it concentrates along riparian and canyon areas. The distribution of the mountain lion is similar to that of the mule deer. Its hunting radius is extensive, since it often preys on deer and follows the herds to and from their seasonal ranges. Mountain lions occur in low densities in northern New Mexico (PSNM 1978). The mountain lion is reported as rare in Colorado (Bissell 1978).

Black Bear: Bissell (1978) reported that black bear are common in Colorado with a habitat preference for riparian and conifer forest. Whitford (1978) indicated bears were uncommon in northern New Mexico.

4.7.1.2 Small Mammals

Small mammals inhabiting the study area include, but are not limited to, raccoons, weasels, mink, coyotes, fox, bobcats, beavers, and muskrats. Appendix D of Burns & McDonnell 1981 includes scientific names and additional species. The following is a brief description of the mentioned species, based on the general habitat in which they are found. Information about the habitat preferences was taken primarily from Burt and Grossenheider (1976) and Whitaker (1980). Additional information was incorporated from the Water and Power Resource Service (1976, 1977a, 1977b).

Riparian and Lake Habitat: The CDOW classifies the beaver, raccoon, and muskrat as common in the study area (Bissell 1978). The incidence of mink has not been determined, but mink are known to breed within the study area (Bissell 1978). The beaver prefers deciduous forest, marshes, and lakes. Muskrat habitat includes streams, lakes, and irrigation ditches where they inhabit burrows in stream banks or lodges built of vegetation and mud. Raccoons are common along riparian habitat, ponds, and irrigated areas.

Forest and Shrub Habitat: The long-tailed weasel, red fox, gray fox, bobcat, and coyote are classified as common in the study area by the CDOW (Bissell 1978). While the short-tailed weasel is generally restricted to higher elevation conifer and mountain shrub habitats, the more common longtailed weasel is less restricted in its habitat requirements. The red and gray fox prefer a mixture of forest, open areas, and brush country. Bobcats and coyotes are found in a variety of habitats with a preference for partially wooded and brushy areas.

4.7.2 Birds

The following is a general description of the bird species found within the study area. Information about habitat preferences was taken from Udvardy (1977), Water and Power Resources Service (1976, 1977a, 1977b), and PSNM (1978).

4.7.2.1 Gallinaceous Birds

Gallinaceous birds within the study area include turkeys, Gambel's quail, ring-necked pheasants, chukars, blue grouse, sage grouse, and sharp-tailed grouse. These species are discussed according to the habitat in which they occur. Appendix D of Burns & McDonnell (1981) includes common and scientific names.

Forest and Shrub: Turkeys are commonly found in pinon-juniper woodlands and ponderosa pine forest with a Gambel oak understory. The blue grouse is found at higher elevations, preferring a conifer forest environment. Sharp-tailed grouse inhabit a variety of vegetative communities, particularly rougher oak brush areas from 2,134-2,473 m (7,000-9,000 feet) in elevation. Gambel's quail inhabits warm dry valleys of saltbush and pinon-juniper woodlands.

Cropland and Sage-Grassland Areas: The ring-necked pheasant is an introduced species preferring farmlands with good vegetative cover. Sage grouse is not widespread in Colorado but is an important game bird requiring open sage-grassland areas. Dry

climate and broken rimrock areas are preferred by chukars, a game bird introduced from Eurasia (Udvardy 1977). Sharp-tailed grouse may occur in sage-grassland areas as well as in more shrubby habitats.

4.7.2.2 Ducks and Geese

The greatest concentrations of waterfowl and shorebirds occur around reservoirs and lakes; however, streams, ponds, and wetland habitats are important. Although most birds of this group migrate south in the fall to New Mexico, Arizona, and Mexico, a few birds of certain species are present year round. Species known to be present during the winter include the Canada goose, mallard, gadwall, American shoveler, American wigeon, blue-winged and green-winged teal, common golden eye, common merganser and the American coot. Kingery and Graul (1978) reported these species as common within the study area. Appendix D of Burns & McDonnell (1981) indicates additional waterfowl, including shorebirds and marsh birds that may occur in the study area.

The study area is not located within the United States' principal waterfowl migration corridors (Bellrose 1976). Major waterfowl concentrations within the study area generally coexist with the bald eagle concentration areas indicated on Figure 4-7 which include the Paonia-Hotchkiss region of Delta County, Colorado. Information received from the CDOW describes two important winter waterfowl concentration areas within the study area. One flock winters on the Colorado River in Mesa County, which feed in the Grand Valley farming area. Another major flock winters in the Gunnison River and its tributaries in Delta and Montrose Counties, feeding in the Gunnison River and Uncompahgre River Valleys. Sweitzer Lake in Delta County also provides a major nesting area for migratory waterfowl (Sandfort and Owens 1967). A great blue heron rookery, including 15 to 20 herons, is located west of Delta, Colorado and 0.5 km (.25 miles) east of the Roubideau Creek and Gunnison River confluence (CDOW 1981b).

4.7.2.3 Pigeons, Doves, and Songbirds

Mourning doves can be found in a variety of habitats including croplands, reservoirs, and shrub lands. The band-tailed pigeon is a summer resident of conifer forest but also frequents pinon-juniper communities. Mourning doves are described as abundant in Colorado and the band-tailed pigeon is classified as fairly common (Kingery and Graul 1978). A large number of songbirds (passerine species) are found in the study area, many of which are migrants. In general, sage-grassland habitats support a variety of bird species, but forest and mountain shrub areas will have a higher diversity of birds (Karr and Roth 1971). Appendix D of

Burns & McDonnell (1981) lists other species which are known to occur in the study area.

4.7.2.4 Hawks, Eagles, and Falcons

The raptors, or birds of prey, that occur in the study area include eagles, hawks, owls, falcons, osprey, and vultures. There is a variety of raptor habitats in the study area, including nesting, hunting, and resting areas. Raptors are attracted to ponds, reservoirs, marshes, and rivers where waterfowl and other prey are present. Specific raptors found in the study area include turkey vultures, red-tailed hawk, rough-legged hawk, Cooper's hawk, American kestrel, marsh hawk, Swainson's hawk, great horned owl, bald eagle, golden eagle, and peregrine falcon. The bald eagle and peregrine falcon are discussed further in Section 4.7.5.

4.7.3 Reptiles and Amphibians

The amphibians and reptiles reported to occur in the study area are widespread in the southwestern United States. Common or abundant species include the northern plateau lizard, Arizona tiger salamander, leopard frog, boreal chorus frog, and the Woodhouse's toad (Bissel 1978). Less common species include the bullfrog, yellow-headed collared lizard, northern sagebrush lizard, northern tree lizard, Utah milk snake, and the wandering garter snake. (See Appendix D of Burns & McDonnell (1981) for the habitat of selected species and scientific names and additional species.)

4.7.4 Fish

Distribution of fish varies by stream and according to differences in water quality within streams. Fish species not listed as threatened or endangered but found within the study area include the brown trout, brook trout, rainbow trout, mottle sculpin, flannelmouth sucker, speckled dace, brassy minnows, fathead minnows, red shiner, smallmouth bass, black bullhead, channel catfish.

The value of the sport fishery resource within the study area ranges from excellent to nonexistent. The following summary of fishery resources in five important rivers within the study area is based on studies conducted by the CDOW (Warner and Janik 1979).

- San Miguel River and Norwood Area: The fishery value is below average to poor because of irrigation, mining, and high water temperatures.
- Gunnison River: The sport fishery value, particularly near the North Fork, has been below average to poor.

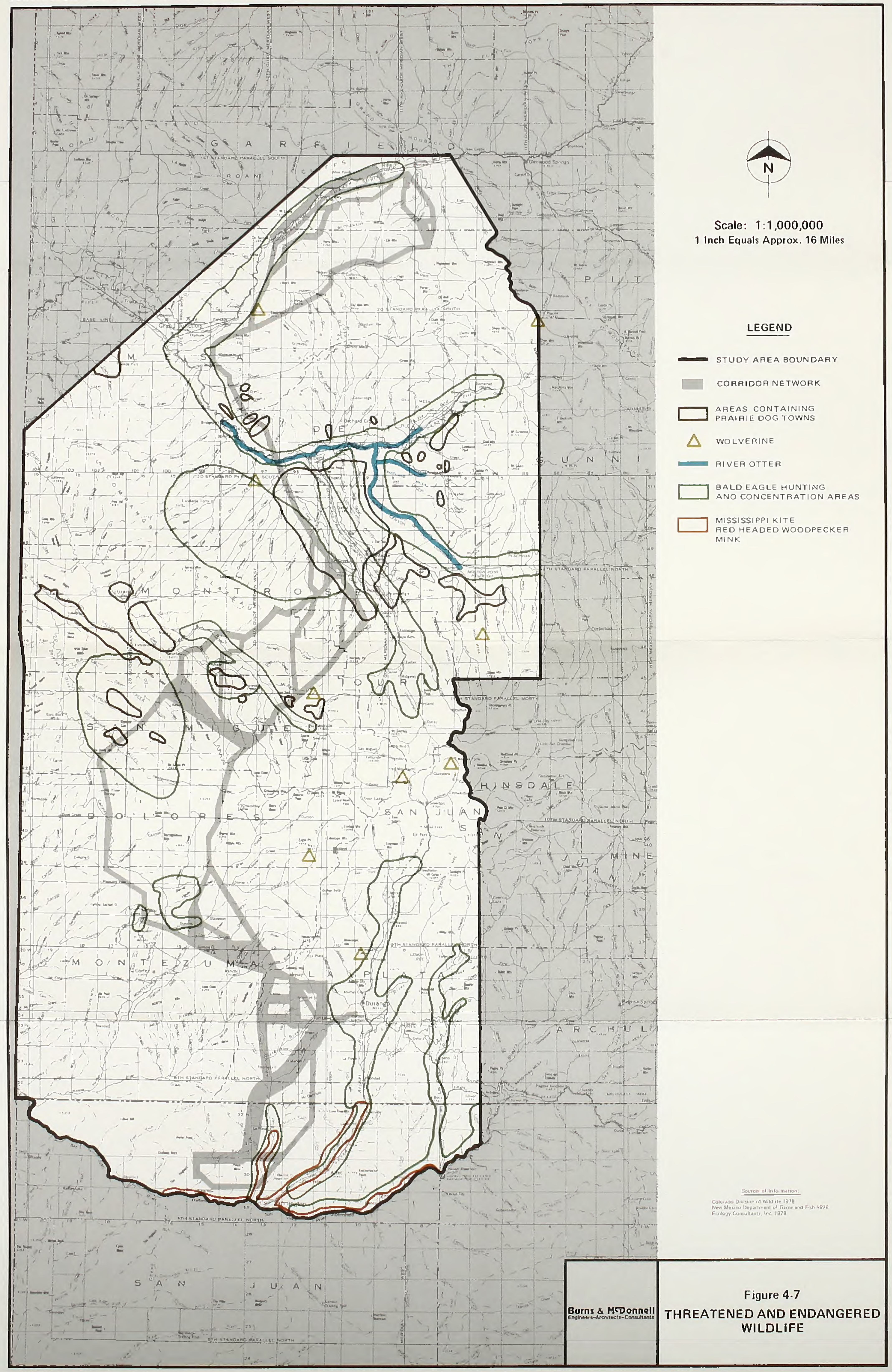


Figure 4-7
THREATENED AND ENDANGERED WILDLIFE

The fish species are mainly sucker and sculpin. In the Gunnison Gorge region, the trout fishery is excellent (BLM 1978b).

- Animas River: The sport fishery value is below average, largely supporting suckers and few game species.

- Uncompahgre River: The fishery value is reported as poor because of mining and channelization efforts.

- Dolores River: The sport fishery is nonexistent due to high temperatures, excessive siltation and salinity, and the intermittent nature of the river. Some carp and suckers survive the dry summer months in small ponds.

4.7.5 Threatened and Endangered Species

A number of animal species that have received federal or state protection may occur in the study area. These species are listed in Table 4-2 and are discussed in the following sections.

4.7.5.1 Federal

In accordance with Section 7 of the Endangered Species Act, the USFWS has advised REA of four species on its endangered list that may be found in the study area and for which a Biological Assessment must be prepared. These species are the bald eagle (Haliaeetus leucocephalus), the peregrine falcon (Falco peregrinus), the black-footed ferret (Mustela nigripes), and the Colorado squawfish (Ptychocheilus lucius).

Bald Eagle: Most bald eagles that occur in the study area belong to the northern subspecies and migrate far to the north of the study area during the summer breeding months. In winter they migrate south where they occupy temporary roosts near riparian habitat and reservoirs; however, eagles have been observed in grasslands and shrublands (Warner and Janik 1979). The eagle's principal food includes fish, waterfowl, and carrion (Warner and Janik 1979). Several nest sites were located in the study area but should not be affected by the proposed project. Figure 4-7 shows hunting and concentration areas for bald eagles in the study area. Eagle concentration areas are those areas where the CDOW and Warner and Janik (1979) indicated the largest number of wintering eagle occurrences. Data collected by Warner and Janik shows the peak number of wintering eagles generally occurs during the January-March period. Reasons for decline of the overall bald eagle population include loss of habitat, removal of mature old growth trees preferred for nesting, pollution of streams, shooting, and poisoning (Sprunt 1972).

Peregrine Falcon: The peregrine falcon has been considered endangered since 1970 by the USFWS. Habitat requirements for peregrine falcons in the Central Rocky Mountain Region vary from site to site. In general, two requirements are necessary to support breeding peregrine falcon populations: 1) adequate nesting habitat, and 2) extensive hunting habitat with sufficient prey to support breeding falcons and their offspring (CDOW 1978). Nesting sites are generally located on cliffs ranging in height from 121-610 m (400-2,000 feet). Hunting territories are usually large since the peregrine falcon will commonly travel 16 km (10 miles) to locate prey, which generally consists of smaller birds (CDOW 1978). The declining populations of this species have been historically associated with the killing and capture of birds on their breeding and wintering grounds and the widespread use of persistent pesticides (Hickey and Roell 1969). The peregrine falcon is most sensitive to human disturbance during the courtship-egg laying period from February through March (CDOW 1978).

Black-footed Ferret: The black-footed ferret is a highly specialized predator that depends on prairie dogs for food and prairie dog tunnels for shelter. As a result of this close association with the prairie dog, the ferret's distribution was and is highly correlated with the distribution of prairie dog towns (Torres 1973). Through the years, programs to eradicate prairie dogs appear to have resulted in the decline of ferret populations (Clark 1976). No confirmed sightings of black-footed ferrets have occurred in the study area in recent years. Should this species be found in the study area, it would most likely be in association with large prairie dog towns 12-40 ha (30-100 acres) (CDOW 1978) or areas with several smaller towns in close proximity to each other. The CDOW assisted in locating the areas with prairie dog towns of sufficient size and numbers to provide habitat for the blackfooted ferret (Figure 4-7). The New Mexico Department of Game and Fish indicated that prairie dogs range throughout the New Mexico portion of the study area; however, there is no record of black-footed ferrets ever being in the study area and their presence is very doubtful (New Mexico Department of Game and Fish 1980a).

Colorado Squawfish: The Colorado squawfish has historically inhabited the main river channels of the entire Colorado River and its major tributaries from Mexico to Wyoming. The species is currently reported as rare or nearly absent from most of its former range. The degradation and alteration of virtually the entire Colorado River Basin by water development projects, with their associated water level fluctuations, is reported as a major reason for declining numbers of squawfish (Joseph and Sinning

1977). The introduction of, and competition with, nonendemic species is another possible reason for declining squawfish numbers. Within the study area the squawfish may occur in the Colorado and Gunnison Rivers near Grand Junction, Colorado, and in the San Juan River in New Mexico.

Four other threatened or endangered species may be found in the study area (Table 4-2), although there is little likelihood that they would be affected by this project and the USFWS has not requested they be evaluated in the Biological Assessment. The whooping crane (Grus americana), the humpback chub (Gila cypha), and the bonytail shub (Gila elegans) are designated as endangered, while the grizzly bear (Ursus arctos horribilis) is designated as threatened.

Whooping Crane: The whooping crane is a federally endangered species whose population in North America has declined to 60 or 70 birds. Reasons for declining populations include habitat destruction, inadvertent shooting of the birds, and a very low reproduction rate (CDOW 1978). The whooping crane presently breeds in Wood Buffalo National Park, Canada and migrates through the plains to winter on the Texas coast at the Aransas National Wildlife Refuge. The main migration path is to the east of Colorado. Recently, an experiment was initiated to propagate the endangered crane whereby greater sandhill crane foster parents raised whooping crane chicks at Gray's Lake, Idaho. The experimental birds from Idaho pass through western Colorado on an unpredictable and sporadic basis. Consequently, no region within the study area is presently considered essential habitat for the whooping crane by the CDOW (1978).

Bonytail Chub: The bonytail chub has not been collected in Colorado since the late 1960s. Historically the bonytail chub inhabited the large tributaries of the Colorado River system, which included the Yampa, Green, Colorado, Gunnison and sometimes the White, San Juan, and Dolores Rivers in Colorado. Since there are no known bonytail chub populations in Colorado, no essential habitat for the species has been designated in the study area. Water development projects and competition with introduced species are likely reasons for the bonytail's decline (CDOW 1978).

Humpback Chub: The humpback chub has been collected in deep, slow-moving canyon-bound waters. Within the study area, the humpback chub may be found in the Colorado River near Grand Junction (CDOW 1978). Water development projects and hybridization with other species (Joseph and Sinning 1977) are likely to have contributed to the rarity of the humpback chub.

Table 4-2

THREATENED AND ENDANGERED WILDLIFE

IN THE STUDY AREA

Common Name	Scientific Name	Status		
		Federal	Colorado	New Mexico
BIRDS				
Bald eagle	Haliaeetus leucocephalus	E[1]	E	E
Mississippi kite	Ictinia mississippiensis			E
Peregrine falcon	Falco peregrinus	E	E	E
Red-headed woodpecker	Melanerpes erythrocephalus			E
Whooping crane	Grus americana	E	E	E
MAMMALS				
Black-footed ferret	Mustela nigripes	E	E	E
Grizzly bear	Ursus arctos horribilis	T[2]	E	
Mink	Mustela vison			E
River otter	Lutra canadensis		E	
Wolverine	Gulo gulo		E	
FISH				
Bonytail chub	Gila elegans	E	E	E
Colorado river cutthroat	Salmo clarki pleuriticus		T	
Colorado squawfish	Ptychocheilus lucius	E	E	E
Humpback chub	Gila cypha	E	E	E
Razorback sucker	Xyrauchen texanus		T	
Roundtail chub	Gila robusta			E

[1]E = Designated as an endangered species.

[2]T = Designated as a threatened species.

Sources:

USFWS Personal Communications

USFWS Endangered Species Technical Bulletin, Endangered Species Program. Washington, D.C.20240

CDOW 1978

New Mexico Department of Game and Fish, 1978

Grizzly Bear: Known populations of grizzly bears are generally associated with isolated or inaccessible regions. Although it is considered likely that this species has been extirpated within the study area, the southern San Juan Mountains appear to have suitable habitats for a breeding population of this species (CDOW 1978).

4.7.5.2 State

In addition to those species listed by the USFWS, four species from the Colorado list of threatened or endangered wildlife may occur in the study area (CDOW 1978). These are the wolverine (*Gulo gulo*), river otter (*Lutra canadensis*), razorback sucker (*Xyrauchen texanus*), and the Colorado River cutthroat trout (*Salmo clarki pleuriticus*). New Mexico lists four additional species of endangered wildlife that may occur in the study area (New Mexico Department of Game and Fish 1978). These are the mink (*Mustela vison*), the Mississippi kite (*Ictinia mississippiensis*), the redheaded woodpecker (*Melanerpes erythrocephalus*), and the roundtail chub (*Gila robusta*).

In the Colorado portion of the study area, there have been no recent confirmed sightings of the wolverine, and no part of the state is currently considered essential habitat. The river otter was extirpated in Colorado, but has been recently reintroduced into the Gunnison River drainage. Figure 4-7 shows the river otter range and the location of recent unconfirmed wolverine sightings in the study area. The Colorado River cutthroat trout occurs in two locations in the state, one of which (Northwater Creek) occurs near the northern boundary of the study area. Within the study area, the razorback sucker frequents the Colorado River from DeBeque, Colorado, downstream to the Utah border; and the Gunnison River from Whitewater, Colorado, downstream to the confluence with the Colorado River.

The mink, Mississippi kite, and the red-headed woodpecker all may occur in association with riparian habitats on the San Juan, La Plata and Animas Rivers in the New Mexico portion of the study area (Figure 4-7). The roundtail chub may be found in the San Juan River drainage in this area (New Mexico Department of Game and Fish 1978).

4.8 Cultural Resources

In order to satisfy a portion of the procedural requirements of the Advisory Council on Historic Preservation, which implements Section 106 of the National Historic Preservation Act of 1966, a cultural resource literature search was conducted. Various site files, which list previously recorded archaeological and historic sites, were reviewed by Nickens and Associates of Montrose,

Colorado. In addition, lists of National Register of Historic Places (NRHP) sites published in the Federal Register were consulted to determine listed and nominated sites within the study area. The following sections describe the results of the searches and the plans to more specifically analyze the cultural resources of the impacted areas.

In addition, cultural resource sensitivity rankings were derived for each of the corridor segments under consideration. The assignment of rank required professional judgment concerning potential cultural resource patterns. Agency archaeologists were queried for their opinions concerning cultural resource sensitivity on lands managed by their respective agencies. Thus, the resulting sensitivity rankings for each segment are based on what is presently known for each segment in the form of previous work and the judgment of several professional archaeologists who are familiar with the cultural resource situation in the various segments. See Appendix B for further discussion.

4.8.1. Archaeological

The earliest known inhabitants of southwestern Colorado date from approximately 10,000 years ago. Whether continuous occupation occurred from that time forward remains an area of speculation (O'Rourke 1980). Nonetheless, the development of these prehistoric civilizations has produced an abundance of archaeological sites in the region. Although a great many sites have been located already, many more remain undiscovered. Little intensive archaeologic study has been conducted on those lands crossed by the alternative routes. The NRHP has five archaeological listings within the study area, one in each of the following counties: Delta, La Plata, Mesa, and Ouray in Colorado and San Juan in New Mexico. Table 4-3, which lists all NRHP sites in the study area, includes archaeological sites and their approximate locations, when such were provided in the original Federal Register listing.

The large number of cultural resource sites that have not been evaluated for or listed on the NRHP for both Colorado and New Mexico includes many of archaeological significance. All sites in the NRHP also appear on the respective State Inventory of Cultural Resources. A complete list of State Inventory sites is included in Appendix E of Burns & McDonnell (1981). The specific locations of the archaeological sites are not included in the list, as requested by the State Historic Preservation Officers (SHPOs) of Colorado and New Mexico. This was done for purposes of site preservation.

To supplement the existing body of information on known sites, the project sponsers will contract an approved archaeologist to perform a professional cultural resource survey to identify as yet undiscovered sites along the delineated ROW.

4.8.2 Historical

The history of southwestern Colorado was based on the use and development of minerals and, later, agricultural lands. Conflicts between white settlers and Ute Indians occurred until around 1881 when the Utes surrendered most of their lands and were relocated to reservations in Utah and far southwestern Colorado (O'Rourke 1980). The relocation of these native Americans opened the region to European settlement and exploitation, particularly in the mining industry. Once cheap rail transportation reached the area, mills were erected to process the mineral ores. Today, mining of coal, uranium, and other energy-related resources dominates the regional economy within the study area.

Agriculture became important as a direct result of the population increases associated with the advent of mining and transportation. The fertile valleys of the Colorado, Gunnison, Uncompahgre, Dolores, and San Miguel Rivers provided rich lands for farming. Irrigation projects further improved the agricultural potential of the region.

Although the recorded history of the area is relatively short, there exists a rich store of historical sites which reflects past developments.

There are 38 NRHP listings and nominations for historic sites within the study area (Table 4-3), in addition to the archaeological sites already discussed. They are distributed throughout all the counties within the study area, with the exception of Delta County, Colorado. The approximate locations are indicated in Figures 3-9, 3-11, and 3-13.

The respective State listings are extensive; all are included in Appendix E of Burns & McDonnell (1981) along with information on their approximate locations. To better illustrate the relative location of these sites within the study area, the locations of the sites are indicated in Figure 4-8. The sites are scattered over the entire study area, with concentration areas in the Telluride-Silverton area and near Durango. In addition to the many sites, the Dominguez-Escalante Trail, marking the first Spanish expedition through the area, crisscrosses the study area. However, this trail cannot be specifically located in the area on the ground.

Table 4-3

NATIONAL REGISTER OF HISTORIC PLACES
LISTINGS WITHIN STUDY AREA
COLORADO

Delta County

1 Bowie Vicinity, ARCHAEOLOGICAL SITES 5DT126 and 5DT127 On Ray Bruce Property (Nominated).

Dolores County

2 Rico, RICO CITY HALL
Northeast corner of Commercial and Mautz Streets.

Garfield County

3 DENVER AND RIO GRANDE RAILROAD

4 Rifle Vicinity, HAVEMEYER-WILLCOX CANAL PUMPHOUSE AND FOREBAY, West of Rifle.

La Plata County

5 DURANGO-SILVERTON NARROW-GAUGE RAILROAD
Right-of-Way between Durango and Silverton.

6 Durango Vicinity, UTE MOUNTAIN UTE MANCOS CANYON HISTORIC DISTRICT, Ute Mountain Ute Indian Reservation.

7 ARCHAEOLOGICAL SITE 5LP262, 5LP263, 5LP264.

8 TACOMA-AMES POWERHOUSE, TERMINAL DAM, ASPAAS DAM, AND WOOD-STAVE FLUME, San Juan National Forest.

9 MAIN AVENUE HISTORIC DISTRICT.
Main Avenue in Durango.

Mesa County

10 Molina Vicinity, CONVICTS' BREAD OVEN.
West of Molina on Co. 65.

11 DeBeque Vicinity, ARCHAEOLOGICAL SITE 5ME82.

12 Grand Junction Vicinity, CROSS LAND AND FRUIT COMPANY ORCHARDS AND RANCH, Northeast of Grand Junction at 3079 F Road.

13 Grand Junction, U.S. POST OFFICE,
400 Rood Ave.

14 Clifton Vicinity, ANDEREGG HOUSE, S. of Clifton at 49B.

Montezuma County

15 Mancos Vicinity, UTE MOUNTAIN UTE MANCOS CANYON HISTORIC DISTRICT, Ute Mountain Ute Indian Reservation.

16 Cortez Vicinity, HOVENWEEP NATIONAL MONUMENT, Northwest of Cortez.

17 Cortez Vicinity, MESA VERDE NATIONAL PARK
10 miles east of Cortez on U.S. 160.

18 Cortez Vicinity, YUCCA HOUSE NATIONAL MONUMENT
12 miles south of Cortez via U.S. 666.

19 Dolores Vicinity, ESCALANTE RUIN, West of Dolores.

Table 4-3

NATIONAL REGISTER OF HISTORIC PLACES
LISTINGS WITHIN STUDY AREA
(Continued)

20 Pleasant View Vicinity, LOWRY RUIN,
30 miles Northwest of Cortez via U.S. 160.
21 Pleasant View Vicinity, PIGGE SITE.

Montrose County
22 Cimarron Vicinity, D&RGW NARROW GAUGE TRESTLE
Northeast of Cimarron.
23 Montrose, THOMAS B. TOWNSEND HOUSE, 222 S. 5th Street.
24 Montrose Vicinity, UTE MEMORIAL SITE.
2 miles South of Montrose on U.S. 50.
25 Montrose Vicinity, GUNNISON WATER TUNNEL
6.5 miles East of Montrose on U.S. 50.
26 Uravan Vicinity, HANGING FLUME,
5.7 miles Northwest of Uravan on Co. 141.

Ouray County
27 Ouray, BEAUMONT HOTEL
28 Ouray, OURAY CITY HALL AND WALSH LIBRARY
6th Avenue between 3rd and 4th Streets.
29 Dallas, OLD DALLAS HISTORIC ARCHAEOLOGICAL DISTRICT
(Nominated).

San Juan County
30 DURANGO-SILVERTON NARROW-GUAGE RAILROAD
Right-of-Way between Durango and Silverton.
31 Silverton, SILVERTON HISTORIC DISTRICT.

San Miguel County
32 Telluride, TELLURIDE HISTORIC DISTRICT
33 Telluride Vicinity, SMUGGLER-UNION HYDROELECTRIC PLANT,
SE of Telluride at Bridal Veil Falls.

NEW MEXICO

San Juan County
34 La Plata Vicinity, MORRIS NO. 41 ARCHAEOLOGICAL DISTRICT
(Site LA20266)
35 Aztec Vicinity, AZTEC RUINS NATIONAL MONUMENT,
1 mile N. of Aztec.
36 Farmington Vicinity, SALMON RUIN, 9 miles East of
Farmington off NM 17.
37 Bloomfield Vicinity, HALFWAY HOUSE ARCHAEOLOGICAL SITE.
38 Bloomfield Vicinity, TWIN ANGELS ARCHAEOLOGICAL SITE.

4.9 Visual Resources

The study area encompasses a variety of landform and vegetation types, as discussed in Sections 4.2 and 4.6. In order to assess the visual resources of the area, the diverse landscapes were evaluated on their ability to conceal the proposed project from the populated and traveled areas. General landforms were examined in conjunction with vegetation types to analyze the visual impact of the proposed project, according to the methodology presented in Appendix C.

Visual absorption capability (VAC) categories were defined by landform and vegetation type to differentiate between landscapes which have a high potential for concealing the project (high VAC), landscapes in which the project would potentially be moderately noticeable (medium VAC), and landscapes in which the project would probably predominate (low VAC). The distribution of these categories over the study area is shown in Figure 4-9. The high VAC areas are hilly, forested lands as opposed to the open grasslands categorized as low VAC. Figure 4-9 presents a generalized view of the location of the various landscape types found throughout the study area.

An analysis of the visual impact potential was conducted by combining the ability of the landscape to conceal the line (VAC) with the user sensitivity of the area crossed by the line. User sensitivity was obtained from BLM visual sensitivity maps, from personnel representing each of the national forests crossed, and from visual sensitivity maps included in the Western Area Survey (PSNM 1978). Visual impact potential is indicated for each corridor segment profile in Section 4.12. See Appendix B for more discussion on methodology.

4.10 Land Use

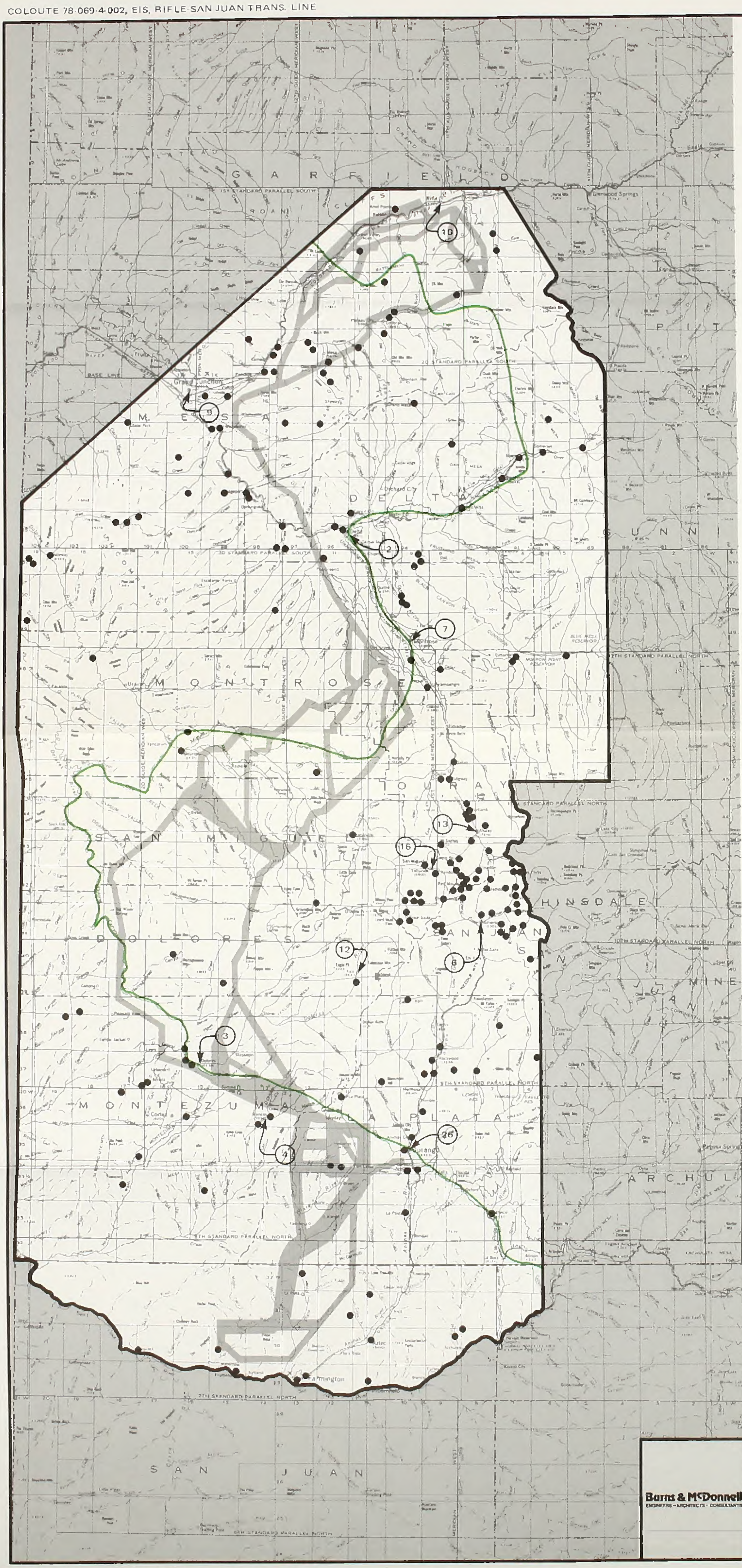
Land ownership for the study area is given in Figure 4-10, while general land use is presented in Figure 4-11.

4.10.1 Urban and Rural Communities

The area affected by the proposed project can be described as primarily rural. Grand Junction, with a 1980 population of 28,144, is the largest city within the Colorado portion of the study area. The population of the Grand Junction urbanized area was 56,854 in 1980 (Bureau of the Census 1982). Durango (population 11,426), Montrose (population 8,722), and Cortez (population 7,095) are population centers for one or more counties, but are not urban in character.

In New Mexico, the City of Farmington recorded a population of 31,222 (U.S. Department of Commerce 1982). Farmington is

COLOUTE 78-069-4-002, EIS, RIFLE-SAN JUAN TRANS. LINE



N

Scale: 1:1,000,000
1 Inch Equals Approx. 16 Miles

LEGEND

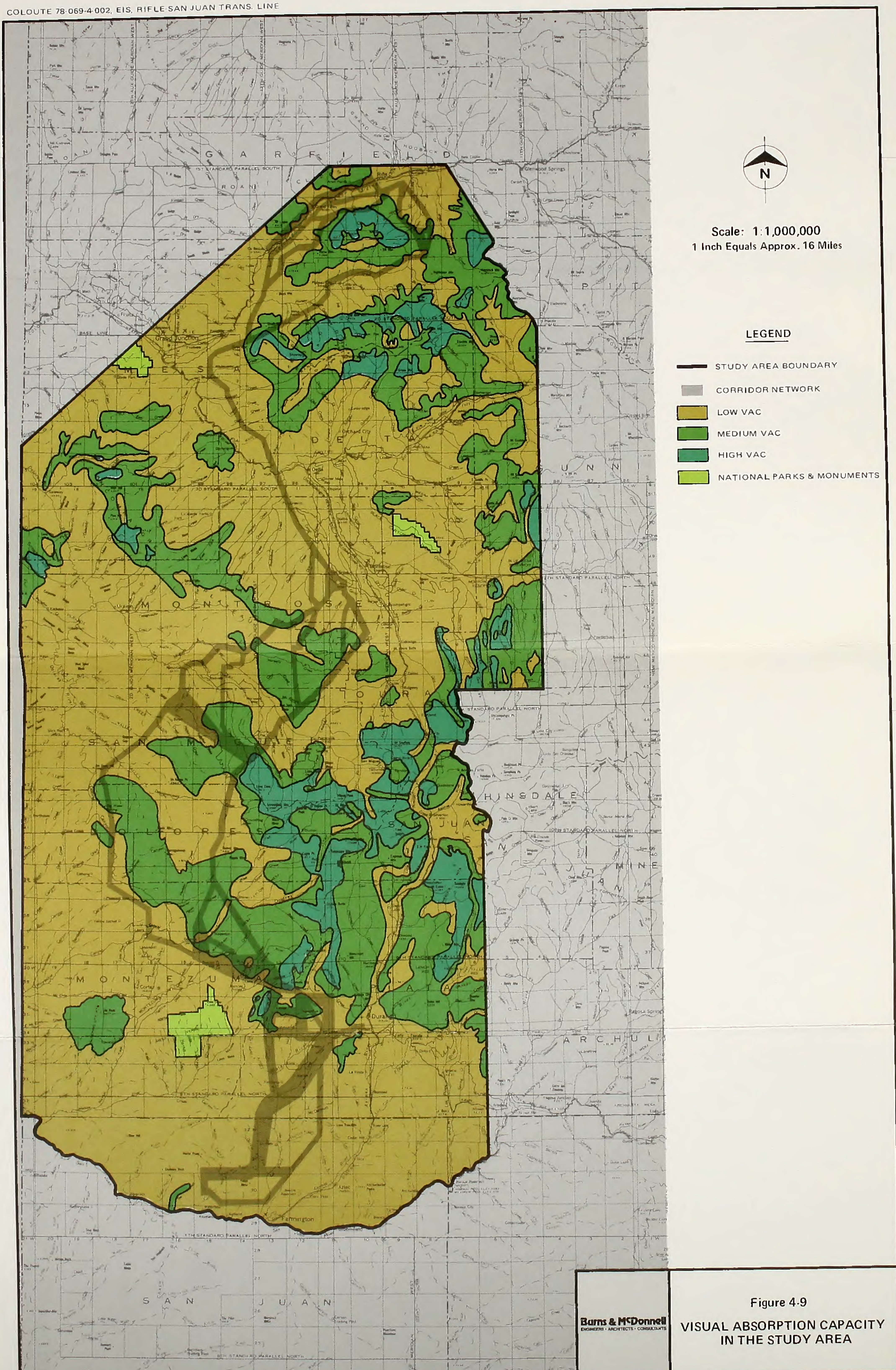
STUDY AREA BOUNDARY
CORRIDOR NETWORK
STATE HISTORICAL REGISTER SITES (TABLE APP. E.-1)
DOMINGUEZ-ESCALANTE TRAIL
(oo) NUMBER OF SITES

Sources of Information
Colorado Historical Society 1979, 1980
Colorado SHPO
New Mexico State Archaeologist and SHPO

Burns & McDonnell
ENGINEERS - ARCHITECTS - CONSULTANTS

Figure 4-8
STATE HISTORIC SITES

COLOUTE 78-069-4-002, EIS, RIFLE-SAN JUAN TRANS. LINE



Burns & McDonnell
ENGINEERS · ARCHITECTS · CONSULTANTS

Figure 4-9

VISUAL ABSORPTION CAPACITY IN THE STUDY AREA

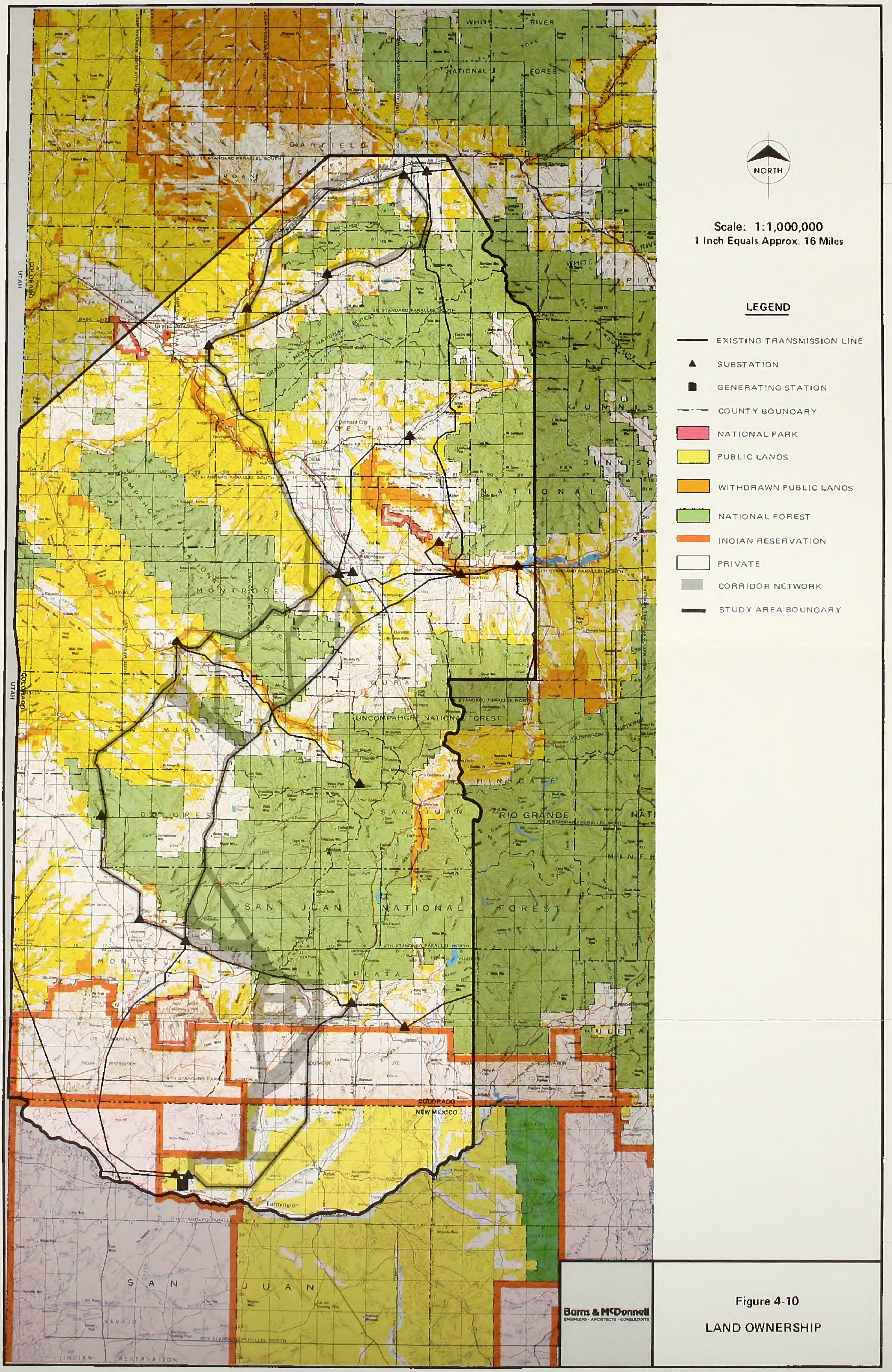


Figure 4-10

LAND OWNERSHIP

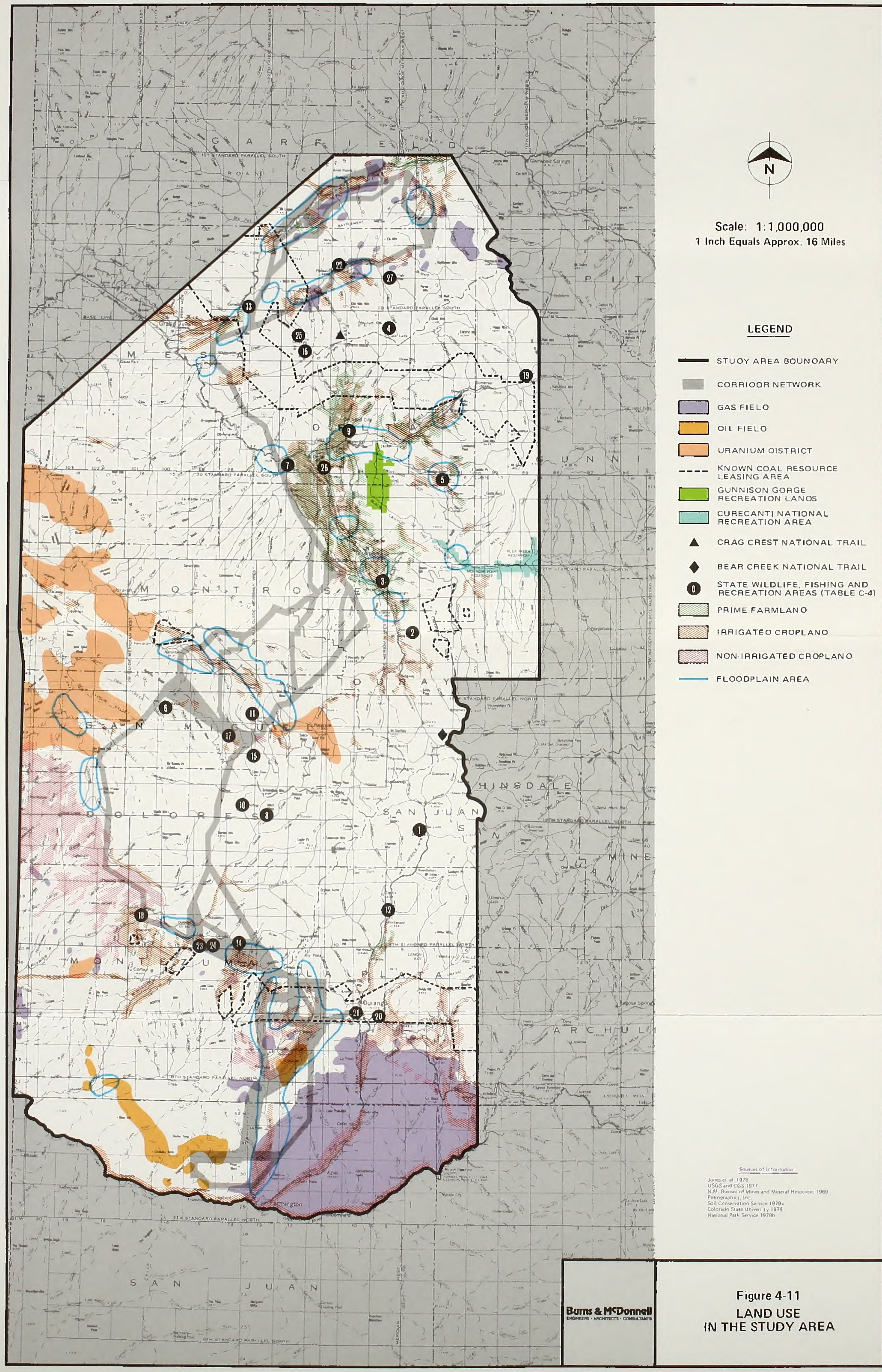


Figure 4-11
LAND USE
IN THE STUDY AREA

located close to the southern boundary of the study area. Aztec (population 5,512) is located north of Farmington, on the Animas River.

The remaining portions of the study area, in both Colorado and New Mexico, are characterized by small scattered towns and communities.

The intensity of human uses has been evaluated along each of the alternative corridors. Lands along the corridor have been classified as high density, low density, recreation, or nonsettled. The criteria for classification are described in Appendix B and the identification of the land classification is shown on each corridor profile in Section 4.12.

4.10.2 Transportation Facilities

A network of federal and state highways interconnect all the major cities and most of the small towns of the study area. State Highways 789 and 550 stretch from Grand Junction, Colorado in the north to Farmington, New Mexico in the south; and along the way, Highway 789 passes through many of the major cities of the Western Slope--Delta, Montrose, Ouray, Silverton, and Durango, Colorado. The most traveled highway in the study area, however, is Interstate Highway 70, which passes through Rifle and Grand Junction connecting them with Denver to the east and central Utah to the west.

Several national and regional trucklines, primarily headquartered in the area's largest cities, provide interstate commercial and industrial hauling in the study area. Continental Trailways operates bus routes to nearly all the communities of the study area.

Part of the study area is served by the Denver and Rio Grande Western Railroad (D&RGW). D&RGW's longest stretch of track in the area parallels Interstate 70 and connects Grand Junction and Rifle with Craig to the north and Pueblo, Colorado Springs, and Denver to the east. No railroads exist in the New Mexico portion of the study area.

Grand Junction, Farmington, and other cities of the area are regularly served by commercial air carriers. Continental, Frontier, and United Airlines operate flights into the study area from California, Utah, and Denver, Colorado. Many of the study area's smaller cities have airports equipped to handle private aircraft.

4.10.3. Fossil Fuel and Mineral Resources

Economically recoverable fossil fuel and mineral deposits, as well as the federal leases which spatially regulate individual energy developments, are scattered throughout the study area. These energy sources include petroleum and natural gas fields; recoverable coal resource areas; oil shale deposits and commercial tracts; and uranium, zinc, vanadium, lead, copper, gold, and silver deposits. Several of these resource deposit areas are shown in Figure 4-11.

4.10.4 Commercial Forests

Several areas of varying spatial extent have been designated within national forests and on public land administered by the BLM as having commercial timberland. Many of these areas are relatively small and as such are not graphically displayed for the entire study area. However, areas along each alternative corridor with potential commercial forest value are identified in the corridor profiles in Section 4.12.

4.10.5 National Formally Classified Areas

Within the study area, there is a variety of nationally classified areas and areas proposed for formal classification. These include areas under protective management such as existing and proposed wilderness areas, national parks and monuments, trails, and wild and scenic rivers. These areas were used in the constraint mapping process to delineate the corridor network. The following paragraphs list and describe these proposed and classified areas according to the managing agency. Refer to Figures 3-9, 3-11, and 3-13 for the location of these areas.

4.10.5.1 Bureau of Land Management

Wilderness Study Areas: BLM is currently conducting a wilderness review to identify public lands having wilderness characteristics. The Wilderness Act of 1964 defines a wilderness area as "... an area of undeveloped federal land retaining its primeval character and influence, without permanent improvements or human habitation, which is protected and managed so as to preserve its natural condition..." The BLM review process is being conducted in three phases: an inventory phase, a study phase, and a report phase. Wilderness study areas (WSAs) were identified from the inventory phase. Reports on the suitability of these WSAs for wilderness designation must be submitted to the President by September 21, 1991 (BLM 1980c).

The WSAs within the study area shown on the constraint maps, Figures 3-9, 3-11, and 3-13, include the following (BLM 1980c):

- Dillon Mesa (CO-030-063)
- American Flats (CO-030-217)
- West Needles Contiguous (CO-030-229A)
- Needle Creek (CO-030-229B)
- Whitehead Gulch (CO-030-230B)
- Weminuche Contiguous (CO-030-238B)
- Handies Peak (CO-030-241)
- Menefee Mountain (CO-030-251)
- Weber Mountain (CO-030-252)
- Cross Canyon (CO-030-265)
- Squaw/Papoose Canyons (CO-030-265A)
- Cahone Canyon (CO-030-265D)
- McKenna Peak (CO-030-286)
- Dolores River Canyon/Coyote Wash (CO-030-290)
- Tabaguache Creek (CO-030-300)
- Sewemup Mesa (CO-030-310A)
- Camel Back (CO-030-353)
- Dominguez Canyon (CO-030-363)
- Adobe Badlands (CO-030-370B)
- Gunnison Gorge (CO-030-388)
- Little Bookcliffs Wildhorse Area (CO-070-066)
- The Palisade (CO-070-132)
- Dominguez (CO-070-150)
- Sewemup Mesa (CO-070-176)

Natural Areas: A natural area is "a physical and biological area which either retains or has reestablished its natural character, although it need not be completely undisturbed, and which typifies native vegetation and associated biological and geological features or provides habitat for rare or endangered animal or plant species or includes geological or other natural features of scientific or educational value" (Colorado Natural Areas Program 1980b). The Natural Areas Program has a cooperative agreement with federal land managers to designate and manage natural areas in Colorado.

Two of the five natural areas within the study area come under the jurisdiction of BLM. The Rare Lizard and Snake Natural Area and Contiguous Lands was not recommended as a WSA through the wilderness review process, but is still under interim management protection until completion of the Wilderness Inventory process. The area covers 443 acres of land surrounded by BLM intensive inventory units CO-030-263 and UT-060-232. The Intensive Inventory and Study Report for Congress has been completed for the Needle Rock Natural Area, with the recommendation that this area does not have wilderness characteristics (BLM 1980c). Figure 4-5 shows the location of these natural areas.

4.10.5.2 Forest Service

Wilderness Areas: Public Law 96-560, signed on December 22, 1980, designated wilderness areas in the Colorado National Forests to be components of the National Wilderness Preservation System. Five areas are located within the study area: the Lizard Head (16,200 ha; 40,000 acres), Mount Sneffels (6,560 ha; 16,200 acres), and Big Blue (39,570 ha; 97,700 acres) Wildernesses; and additions to the Weminuche (26,730 ha; 66,000 acres) and West Elk (53,865 ha; 133,000 acres) Wildernesses.

Natural Areas: Three of the five natural areas within the study area come under the jurisdiction of the FS. The FS has declared the Narraguinnep Natural Area as a Research Natural Area, thus preserving its excellent example of undisturbed plant communities in southwest Colorado by allowing only research-oriented activity within the area. The Escalante Creek Blue Spruce Forest, located in Montrose County, is currently under consideration for designation as a Research Natural Area, pending Congressional approval. The Dry Mesa Pinon-Juniper Forest has been dropped from further consideration by the FS, but is classified as an "identified" natural area by the Colorado Natural Areas Program (FS 1980a, Colorado Natural Areas Program 1980a).

Wild and Scenic River Proposals: The FS and the Heritage Conservation and Recreation Service (HCRS-no longer in existence; activities now performed by the NPS) have proposed sections of the Dolores River for inclusion in the National Wild and Scenic River Systems. From a study of four segments of the Dolores River, 169 km (105 miles) were proposed in 1976, consisting of that portion of the river from 2.1 km (1.3 miles) below the proposed McPhee Dam site to 1.6 km (one mile) above the Highway 90 bridge near Bedrock.

The joint FS-HCRS proposal recommends 53 km (33 miles) for "wild" designation, 66 km (41 miles) for "scenic" designation, and 50 km (31 miles) for "recreational" designation. According to Section 2(b) of the Wild and Scenic Rivers Act, wild river areas are defined as "free of impoundments and generally inaccessible except by trail, with watersheds or shorelines essentially primitive and waters unpolluted." Scenic rivers are defined less stringently, to allow more accessibility by roads. The recreational category is the least stringent, allowing ready access and some development along the shoreline. Figures 3-9, 3-11, and 3-13 show the location of the river segments proposed for wild and scenic designation, considered to be areas inhibiting transmission line crossings (FS 1976).

Trails: National Recreation Trails designated by the FS are discussed in Section 4.10.6.4.

4.10.5.3 Park Service

National Parks: One National Park lies within the study area (see Figure 3-13). The Mesa Verde National Park, located in the southern portion of the study area, is the site of a variety of Indian ruins ranging from the pithouses of the 500 A.D. era to the cliff dwellings of the 1200 A.D. period (Colorado Recreation Guides, Inc. 1978).

National Monuments: Five National Monuments exist within the study area. The Black Canyon of the Gunnison National Monument is the deepest part of a gorge cut by the Gunnison River. Within the monument boundaries, the canyon depth ranges from 527-739 meters (1,730-2,425 feet). This monument also serves as a sanctuary for native animals (Colorado Recreation Guides, Inc. 1978).

The southern portion of the Colorado National Monument, near Grand Junction, is also included in the study area. This monument is known for its sheer cliffs, unusual rock formations, and dinosaur bones. It also serves as a wildlife refuge, and supports a small herd of bison (Colorado Recreation Guides, Inc. 1978).

Three smaller monuments are located in the southern portion of the study area. The Hovenweep National Monument, near Cortez, is an isolated area of Indian ruins and the site of the Square Tower Ruins Campground. The Yucca House National Monument, located southwest of Cortez, is an undeveloped site of Indian ruins, currently closed to the public. The Aztec Ruins National Monument is located in the New Mexico portion of the study area (Colorado Recreation Guides, Inc. 1978).

Existing and Proposed Wilderness Areas: The NPS designated two wilderness units within the study area. The northern shoulders of Mesa Verde National Park are classified as the Mesa Verde Wilderness (NP-012), and the Black Canyon of the Gunnison National Monument has been established as Wilderness NP-003. A portion of the Colorado National Monument within the study area is currently under proposal as Wilderness NP-909 (FS 1979c).

National Trails: No National Trails are located within the study area. The Dominguez-Escalante Trail was studied by the NPS for possible inclusion into the system, and is shown in Figure 4-8. However, it was not recommended for inclusion (NPS 1983b).

Wild and Scenic River Proposals: Two rivers within the study area are being studied by the NPS for classification under the Wild and Scenic Rivers Act. The NPS and the Colorado Department of Natural Resources are jointly recommending that 42 km (26 miles) of the Gunnison River be classified as a "wild" river. This portion extends from the upstream boundary of the Black Canyon of the Gunnison National Monument to about 1.6 km (1.0 mile) below the confluence with the Smith Fork (see Figure 3-9). An additional 4.3 km (2.7 mile) segment below the Smith Fork was also studied, but contained no outstandingly remarkable values and is not eligible for inclusion (NPS 1979b).

A portion of the lower Dolores River was also recommended by the NPS for "scenic" designation, in February of 1979. The portion of the river within the study area extends from the Colorado Highway 141 bridge at Gateway to the Colorado-Utah border, for a distance of approximately 13 km (8 miles) (NPS 1979a).

Congress has not taken action on either recommendation. Currently, both rivers, which are mandated by Congress to be studied, have protection and withdrawal commitments along the entire study corridor until Congress takes action on designation (NPS 1983a).

Natural Landmarks: The HCRS (no longer in existence) investigated an area near Ophir, Colorado, known as the Ophir Needles, for possible designation as a Natural Landmark. It now has the status of a potential landmark, but has not yet been designated. The Ophir Needles are a group of rock spires located approximately 13 km (8 miles) south of Telluride on Highway 145 (NPS 1983b).

4.10.6 Recreational Resources

Recreational resources are found throughout the study area. Nearly all the national areas discussed in Section 4.10.5. provide an opportunity for recreational use. The FS has identified that concentrated recreation use occurs on Grand Mesa. In addition to these areas, the following resources are available.

4.10.6.1 State Areas

The CDOW manages several state wildlife areas and state fishing areas within the study area. State recreation areas are managed by the Division of Parks and Outdoor Recreation. Table 4-4 lists the state areas within the study area, while Figure 4-11 shows their location.

Fishing Areas: There are 14 state fishing areas (SFA) within the study area, five with proximity to the corridor network. The

Table 4-4
COLORADO WILDLIFE, FISHING AND RECREATION AREAS
IN THE STUDY AREA

1	Andrews Lake State Fishing Area	San Juan County
2	Billy Creek State Wildlife Area	Ouray County
3	Chipeta Lakes State Fishing Area	Montrose County
4	Colby Horse Park Reservoir	Mesa County
5	Crawford Reservoir State Recreation Area	Delta County
6	Dry Creek Basin State Wildlife Area	San Miguel County
7	Escalante State Wildlife Area	Delta County
8	Fish Creek State Wildlife Area	Dolores County
9	Fruitgrower's Reservoir State Fishing Area	Delta County
10	Groundhog Reservoir State Fishing Area	Dolores County
11	Gurley Reservoir State Fishing Area	San Miguel County
12	Haviland Lake State Fishing Area	La Plata County
13	Island Acres State Recreation Area	Mesa County
14	Joe Moore Reservoir State Fishing Area	Montezuma County
15	Lone Cone State Wildlife Area	San Miguel County
16	Mesa Lake #1 State Fishing Area	Mesa County
17	Miramonte Reservoir State Recreation Area	San Miguel County
18	Narraguinnep Reservoir State Fishing Area	Montezuma County
19	Paonia Reservoir State Recreation Area	Gunnison County
20	Pastorius Reservoir State Fishing Area	La Plata County
21	Perkins Peak State Wildlife Area	La Plata County
22	Plateau Creek State Wildlife Area	Mesa County
23	Puett Reservoir State Fishing Area	Montezuma County
24	Summit Reservoir State Fishing Area	Montezuma County
25	Sunset Lake State Fishing Area	Mesa County
26	Sweitzer Lake State Recreation Area	Delta County
27	Vega Reservoir State Recreation Area	Mesa County
28	Woods Lake State Fishing Area	San Miguel County

Fruitgrowers Reservoir SFA, which has 243 surface ha (600 surface acres) of water, lies 1.6 km (1.0 mile) south of Cedaredge. The Gurley Reservoir SFA, with 147 surface ha (363 surface acres) of water, lies south of Norwood. The Narraguinnep Reservoir SFA is close to Cortez and offers waterfowl hunting and fishing on 347 surface ha (857 surface acres). The Puett Reservoir SFA has waterfowl hunting on 57 surface ha (140 surface acres) of water and is located near Mancos. The Summit Reservoir SFA has lake fishing on 178 surface ha (440 surface acres) of water, and lies northwest of Mancos. The Joe Moore Reservoir SFA near Mancos offers lake fishing on 18 surface ha (45 surface acres) (Colorado Recreation Guide, Inc. 1978).

The remaining state fishing areas, located farther from the corridor network, include the Andrews Lake, Chipeta Lakes, Colby Horse Park Reservoir, Groundhog Reservoir, Haviland Lake, Mesa Lake No. 1, Pastorius Reservoir, Sunset Lake, and Woods Lake state fishing areas.

Wildlife Areas: There are seven state wildlife areas (SWA) within the study area. The Dry Creek Basin SWA has big game hunting on 3,537 ha (8,733 acres) of land in the vicinity of Norwood. The Escalante SWA, just west of Delta, hosts big and small game hunting on 2,891 ha (7,139 acres) of land. The Plateau Creek SWA has big game hunting on 595 ha (1,346 acres) and is three miles west of Collbran. The Lone Cone SWA has big game, upland game, and bird hunting on over 2,037 ha (5,030 acres) near Norwood. The remaining state wildlife areas include the Billy Creek SWA in Montrose County, the Fish Creek SWA in Dolores County, and the Perins Peak SWA in La Plata County (Colorado Recreation Guide, Inc. 1978).

Recreation Areas: Six state recreation areas (SRA) lie within the study area boundaries. The Crawford Reservoir SRA has 20 camping units, 221 ha (821 acres) of land, and 161 surface hectares (397 surface acres) of water. It lies 1.6 km (1.0 mile) south of Crawford. Island Acres SRA, 24 km (15 miles) east of Grand Junction, has lake fishing over 1.6 ha (4 acres) and stream fishing in the Colorado River, as well as 32 camping units. The Miramonte Reservoir SRA lies near Norwood. It has lake fishing on 119 surface ha (294 surface acres) of water and 17 camping units on 208 ha (514 acres) of land. The Vega Reservoir SRA is located east of Collbran, and offers camping in addition to lake fishing. The remaining state recreation areas include the Paonia Reservoir SRA in Gunnison County, and Sweitzer Lake SRA in Delta County (Colorado Recreation Guide, Inc. 1978).

4.10.6.2 Gunnison Gorge Recreation Lands

The Gunnison Gorge Recreation Lands, approximately 12,150 ha (30,000 acres) in size, encompass approximately 22 km (14 miles) of the Gunnison River. This area, shown in Figure 4-11, is managed by BLM to offer the visitor foot or horse access to the river canyon (BLM 1978b, NPS 1979b).

4.10.6.3 Curecanti National Recreation Area

The Curecanti National Recreation Area, managed by the NPS, supports localized, intensified visitor use (BLM 1978b). This area, shown in Figure 4-11, encompasses the Morrow Point Reservoir and the Blue Mesa Reservoir.

4.10.6.4 Trails

Many trails are located throughout the study area and utilized for recreational activities. The FS has requested that the Crag Crest and Bear Creek National Trails be recognized as existing within the study area (Rupp and Andrus 1979). The Crag Crest Trail is located in the Grand Mesa National Forest (see Figure 4-11), and was designated as a National Recreation Trail by the FS on March 14, 1978. The trail follows a 16 km (10 mile) circular route and is restricted to foot and horse travel (FS 1979a). The Bear Creek Trail is located south of Ouray, in the Uncompahgre National Forest.

4.10.7 Agricultural Areas

4.10.7.1 Prime Farmland

Prime Farmland is described qualitatively by the SCS of the USDA as "... land used for the production of food and fiber, or available for these uses. It has a soil quality, growing season, and moisture supply needed to produce economically sustained high yields of crops when treated and managed according to modern farming methods (USDA 1975)." The majority of the prime farmland in the study area, as delineated by the SCS, is concentrated in the North Fork Valley, Orchard City, and Delta-Montrose areas. Smaller concentrations are located east of Rifle, southeast of Durango, south of Cahone and east of Grand Junction (see Figure 4-11) (Colorado State University 1979). In New Mexico, prime farmland is centered around Farmington along the Animas, La Plata, and San Juan Rivers (SCS 1979b).

4.10.7.2 Important Farmland

Important farmlands include irrigated and nonirrigated croplands, as delineated by SCS. Important farmlands occur generally in the same portions of the study area as prime farmland. An exception is a large area of important farmland extending from Egnar along the Dolores River to the Mesa Verde National Park (SCS 1979a).

4.10.8 Wetlands

Wetlands are defined as those areas that are inundated by surface or groundwater with a frequency sufficient to support, and under normal circumstances do or would support a prevalence of vegetative or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction (Federal Register 1977a). Wetlands in the study area generally include river, reservoir, and pond habitat. These areas are similar to areas described as riverine, lacustrine, and palustrine by Cowardin et al. (1979). These types of aquatic environments furnish essential habitat for many species of birds, mammals, amphibians, reptiles, fish and invertebrates.

Protecting wetlands is necessary to prevent them from losing their value as wildlife habitat, natural flood control mechanisms and pollution filtration systems (Horwitz 1978). Executive Order 11990, signed in May 1977, establishes federal policy to preserve and enhance the natural and beneficial values of wetlands. Federal agencies are required to take action to avoid adversely impacting wetlands wherever possible, to minimize wetlands destruction, and to preserve the values of wetlands (Federal Register 1977a).

The information on wetlands in southwestern Colorado is minimal, due primarily to the limited amount of wetland areas in this semi-arid region. Communication with the USFWS, the COE and SCS revealed that a wetlands map of the study area has not been developed. A map review using U.S.G.S. 7-1/2-minute topographic maps and an aerial examination of the potential significant wetland areas that may be impacted by the proposed project, were conducted to provide the necessary information for an assessment of the project impacts.

For the purpose of reviewing the potential significant wetlands within the study area, significant wetlands were defined as wetland areas that are too broad, 305 m (1,000 feet) or more, to be spanned by the proposed project. Significant, in this case, does not refer to the value of the wetland as wildlife habitat.

During map review some areas identified as wetlands or marshes on topographic maps, or that appeared to be subject to poor drainage, were found to exist within the corridor network. Seventeen of these areas had a width greater than 305 m (1,000 feet). These areas were examined by airplane to determine if they were wetland areas and if they could be spanned by the proposed project. Potential significant wetlands identified in the corridors consisted of flowing water in streams or rivers, dry channels of

intermittent streams or rivers, and standing water in ponds or reservoirs. Some potential wetland areas also consisted of narrow bands of marshy areas associated with rivers, streams, reservoirs, and poorly drained areas.

No actual wetland areas were determined by aerial examination and map review to be greater than 305 m (1,000 feet); therefore, no wetland areas that could not be spanned are found in the area.

4.10.9 Floodplains

Information on floodplains and flood prone areas is important because obstructions in the floodplain tend to raise the water surface elevations upstream during a flood. This effect generally is more relevant to a large, solid construction than to transmission towers. However, transmission towers in the floodplain would be susceptible to structural damage from the forces of floodwater and flood-borne debris.

Flooding in southwestern Colorado can result from large frontal-type rainstorms approaching from the southwest, from rapidly melting snow, and from localized cloudbursts. Flooding from general rain can occur from mid-June through December, but records show that major flood-producing rainstorms in this area most frequently occur in September and October.

Section 6(c) of the Executive Order 11988 (1977) defines floodplains as the lowland and relatively flat areas adjoining inland and coastal waters, including flood prone areas of offshore islands, including that area subject to a 1 percent or greater chance of flooding in any given year (100-year floodplain). The Executive Order directs federal agencies to avoid, to the extent possible, the long- and short-term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct or indirect support of floodplain development wherever there is a practicable alternative (Federal Register 1977b).

To delineate the floodplains of the affected environment and assess potential impacts to those floodplains greater than 305 m (1,000 feet) in width, contact was made with the U.S. Department of Housing and Urban Development/Federal Insurance Administration, and the COE. Floodplain maps and literature for the areas where the proposed project could cross major rivers were requested. Aerial examination was made of 17 river and stream crossings to aid in identifying potential floodplain areas.

The proposed project may cross five large rivers and several smaller streams, many of which have an intermittent nature.

Figure 4-11 identifies specific areas where the proposed project may cross floodplain areas of major rivers or streams (flood prone and wetland areas).

4.11 Social and Economic Profile

4.11.1 Population

Populations in most parts of the study area have grown in the last two decades, although there has been a wide variation among the rates of growth. In the period from 1970 to 1980, these ranged from 0.2 percent in San Juan County, indicating an essentially stable population, to 63.8 percent in San Miguel County. Counties experiencing high increases in population include Mesa County, which grew by 27,156 persons during this period; and San Juan County in New Mexico, which grew by 28,733 persons. La Plata and Garfield Counties also experienced considerable growth. The average population increase in the study area counties over the 10-year period was 35.7 percent. The total population increase in the 12-county area from 1970 to 1980 was 92,042, or 45.7 percent (see Table 4-5).

The population statistics of the past decade represent a clear departure from the previous decade. Almost every county has experienced an increase in growth rates during the 1970s. The population increase from 1960-1970 was only 2.6 percent. The sharpest reversal was experienced in San Miguel County, whose population decreased by one-third in the 1960s and increased by nearly two-thirds in the 1970s. Two counties in Colorado, San Juan and Gunnison, showed almost no population growth from 1970-1980.

The average density of population among the study area counties was 9.6 persons per square mile in 1980. This is a very sparse density typical of rural western areas. Densities vary from 25 persons per square mile in Mesa County to two in Dolores, San Miguel and San Juan Counties. Densities and other information from the U.S. Census are presented in Table 4-6. Delta County has a large proportion of older people in its population, whereas Gunnison County and San Juan County, New Mexico have younger populations. Levels of educational attainment throughout the study area are close to state and national averages.

4.11.2 Employment and Income

In 1982 total employment in the study area numbered 135,601 workers, an increase of 9.6 percent over 1979. Four Colorado counties in the study area (Montezuma, Montrose, San Juan, and San Miguel) showed declines in total employment from 1979 to 1982. Employment increases in the other counties ranged from 4.1 percent to 20.3 percent over the same time period (see Table 4-7).

Table 4-5
POPULATION TRENDS FOR THE STUDY AREA
1950-1980

County	1950	1960	1970	1980	Percent Change 1970-1980
Montezuma	9,991	14,024	12,952	16,510	27.5
La Plata	4,880	19,225	19,199	27,424	42.8
Dolores	1,966	2,196	1,641	1,658	1.0
San Miguel	2,693	2,944	1,949	3,192	63.8
Gunnison	5,716	5,477	7,578	10,689	41.1
Montrose	15,220	18,268	18,366	24,352	32.6
Ouray	2,103	1,601	1,546	1,925	24.5
Delta	17,365	15,602	15,286	21,225	38.9
Garfield	11,625	12,017	14,821	22,514	51.9
Mesa	38,974	50,715	54,374	81,530	49.9
San Juan	1,471	849	831	833	0.2
San Juan, N.M.	18,800	53,200	52,700	81,433	54.5
Total	140,804	196,136	201,243	293,285	45.7

Source: U.S. Department of Commerce, Bureau of the Census, County and City Data Book, 1952, 1967, 1972, 1982.

Table 4-6
STATISTICAL INFORMATION FOR THE STUDY AREA
1980

County	Population	Persons Per Square Mile	Percent Urban	Median Age	Percent 65 Years & Over	Percent High School Graduates
Montezuma	16,510	8	43.0	28.7	9.8	64.2
La Plata	27,424	16	41.7	27.5	8.6	79.8
Dolores	1,658	2	0	30.1	10.4	88.5
San Miguel	3,192	2	0	28.8	5.5	85.1
Gunnison	10,689	4	54.1	23.9	4.6	89.9
Montrose	24,352	11	35.8	30.7	11.6	69.9
Ouray	1,925	4	0	32.8	11.7	77.2
Delta	21,225	18	18.5	34.2	17.9	68.0
Garfield	22,514	8	34.9	28.6	8.9	80.4
Mesa	81,530	25	73.1	29.0	10.7	74.5
San Juan	833	2	0	27.4	4.4	81.7
San Juan, N.M.	81,433	15	60.0	24.2	5.8	65.1

Source: U.S. Department of Commerce, Bureau of the Census, 1980 Census of Population and Housing, 1982.

Table 4-7

TOTAL EMPLOYMENT FOR THE STUDY AREA

County	1979[1]	1982[2]	Percent Change 1979-1982	Percent Unemployment 1982[2]
Montezuma	6,364	6,172	-3.0	10.2
La Plata	13,395	14,172	5.8	9.2
Dolores	558	671	20.3	9.2
San Miguel	1,473	1,456	-1.2	10.1
Gunnison	4,901	5,846	19.3	7.6
Montrose	10,315	10,298	-0.2	11.9
Ouray	467	486	4.1	17.1
Delta	7,049	7,837	11.2	10.6
Garfield	11,152	12,655	13.5	13.6
Mesa	36,032	40,918	13.6	11.1
San Juan	424	331	-21.9	15.3
San Juan, N.M.	31,595[3]	34,759[4]	10.0	13.8
Total	123,725	135,601	9.6	

Source: [1]Colorado Division of Employment and Training, County Labor Force Estimates, January-December, 1979, February 1980.
[2]Colorado Division of Employment and Training, County Labor Force Estimates, October 1982.
[3]New Mexico Division of Employment and Training, 1980
[4]New Mexico Employment Security Department, October 1982.

The rate of unemployment in the labor force for the Colorado counties in the study area averaged 11.4 percent in October 1982. The average for the state was 8.3 percent. High unemployment in Ouray and San Juan Counties, at 17.1 percent and 15.3 percent, respectively, is due somewhat to the seasonal tourist business in these areas. Unemployment in San Juan County, New Mexico was 13.8 percent at this time.

Per capita incomes for the study area counties for 1980 are shown in Table 4-8. The per capita income for the entire state of Colorado was $7,999. Only Garfield and Mesa Counties approached the state level, due mainly to the oil shale and other mining activities in those counties. The rest of the counties in the study area exhibited income levels considerably below the state level.

4.11.3 Agriculture

Consistent and widespread trends have been observed in American agriculture during this century. These include a decreasing number of farms, a decreasing amount of land in farms, and an increasing average size of farms. Recent statistics show that these trends do not hold entirely true in the study area. Although comparative information for the 1974-1978 period is unavailable from three of the counties, figures from the other nine show that the number of farms increased by 5.2 percent in these four years. The number of acres in farms increased by 4.2 percent. The average size of farms in the nine-county area stayed nearly constant (see Appendix G of Burns & McDonnell 1981).

Much of the increase in the number of farms occurred in Mesa and Garfield Counties, while increases in acreage were most marked in Montezuma and Gunnison Counties. Decreases in farm acreage took place in Mesa and Ouray Counties, more than offsetting the increase in number of farms in Mesa County.

The average size of farms varies greatly. In 1978 average sizes ranged from 1,145 ha (2,828 acres) in San Miguel County to 135 ha (334 acres) in Delta County. The average for the entire study area was 320 ha (790 acres). The variation is related to the types of crops grown and the topographic conditions in different areas.

Between 1974 and 1978 the total value of agricultural products sold rose from $103,420,000 to $137,730,000 (for nine of the twelve counties). This is an increase of 33.2 percent, which is 2.5 times greater than the increase in the Producer Price Index for farm products during this period, which may indicate a

Table 4-8
PER CAPITA INCOME FOR THE STUDY AREA
1980

County	1980
Montezuma	5,963
La Plata	6,728
Dolores	5,381
San Miguel	6,346
Gunnison	6,630
Montrose	6,379
Ouray	6,770
Delta	5,519
Garfield	7,722
Mesa	7,162
San Juan	6,061
San Juan, N.M.	5,814

Source: U.S. Department of Commerce, Bureau of the Census, 1980 Census of Population and Housing, November 1982.

substantial real gain in agricultural sales revenue. The average per farm for the nine counties rose from $22,755 to $28,769, an increase of 26.5 percent. These increases took place despite a drop in the value of crop production sold of 8.2 percent. The decrease was countered by an increase in livestock value of 57.0 percent. Since the actual numbers of livestock produced declined, the overall increase is due to a considerable increase in livestock prices (see Appendix G, Burns & McDonnell 1981).

The leading agricultural counties in the Colorado portion of the study area are Mesa and Montrose. Ouray and San Miguel Counties sold relatively few agricultural products. It is evident that livestock is the major product group in the study area. It accounted for more than two-thirds of the value of farm sales in 1978. Despite its importance, the actual number of livestock declined by 16.7 percent. This decline was particularly great among sheep, although cattle numbers also dropped (see Appendix G, Burns & McDonnell 1981).

4.11.4 Industry, Trade, and Services

The character of the manufacturing sector in the study area is changing rapidly. The total number of manufacturing establish ments increased by 18.1 percent between 1977 and 1980. Mesa County and San Juan County, New Mexico gained particularly large numbers of new plants during this period. However, Montezuma, San Miguel, and Montrose Counties lost manufacturing plants during this period.

The presence of manufacturing establishments in an area is important because of their role as a source of basic employment, placing money into the community through their payrolls. In 1977, 2,943 retail, 505 wholesale and 2,782 service establishments in the study area generated sales of $987,780,000, $615,120,000, and $178,623,000 respectively (Appendix G, Burns and McDonnell 1981).

4.12 Environmental Profile of Corridor Segments

Resource information for the entire study area has been presented in the previous sections. This section describes the specific affected environment along each of the alternative corridors presented in Section 2.0. Profiles of the entire length of each segment have been developed, describing 19 resource characteristics. The characteristics include those listed in the Profile Legend, Table 4-9, as well as elevation. Each profile shows the length of a particular corridor that crosses a mapped characteristic and the location of that crossing. The respective lengths of resources crossed were scaled by overlaying the corridor

alternatives on the resource maps developed for the preceeding sections. The first three characteristics in Table 4-9 (construction and maintenance limitations, erosion hazard, and reclamation potential) utilize a rating discussed in Section 4.4. The visual absorption capacity rating is discussed in Section 4.9 and Appendix C. The visual sensitivity, commercial forests, and human resource categories are discussed in Appendix B.

Table 4-9
PROFILE LEGEND
(Accompanies Figures 4-12 through 4-32)

Construction and Maintenance Limitations
- 1 - Slight
- 2 - Moderate
- 3 - Major

Erosion Hazard
- 1 - Low
- 2 - Moderate
- 3 - High

Reclamation Potential
- 1 - Good
- 2 - Fair
- 3 - Poor

Potential Geologic Hazard
- 1 - Stable
- 2 - Unstable

Vegetative Communities (Ecotypes)
- AG - Agriculture
- S - Saltbush and Greasewood
- CA - Conifer-Aspen
- PJ - Pinon-Juniper
- MS - Mountain Shrub
- SG - Sagebrush and Grassland
- B - Barren

Threatened and Endangered Fauna
- PD - Prairie Dog
- W - Wolverine
- RO - River Otter
- BE - Bald Eagle Hunting & Concentration Areas
- M - Mississippi Kite, Red-Headed Woodpecker, Mink

Large Mammals
- 1a - Mule Deer and Elk Calving and Fawning Areas
- 1b - Mule Deer and Elk Critical Winter Range
- 2b - Spring Creek Basin Horse Herd

Cultural Resources
- DE - Dominguez-Escalante Trail Crossing
- S - State Historical Register Sites
- N - National Historical Register Sites

Human Resources
- L - Low Density
- H - High Density
- N - Nonsettled
- R - Recreation

Land Ownership
- P - Public Lands
- WP - Withdrawn Public Lands
- NF - National Forest
- I - Indian Reservation
- PR - Private
- S - State Lands

County
- As Designated

Mineral Resource Areas
- C - Known Coal Resources Leasing Areas
- O - Oil Field
- G - Gas Field

Agricultural Areas
- P - Prime Farmland
- I - Irrigated Cropland
- N - Nonirrigated

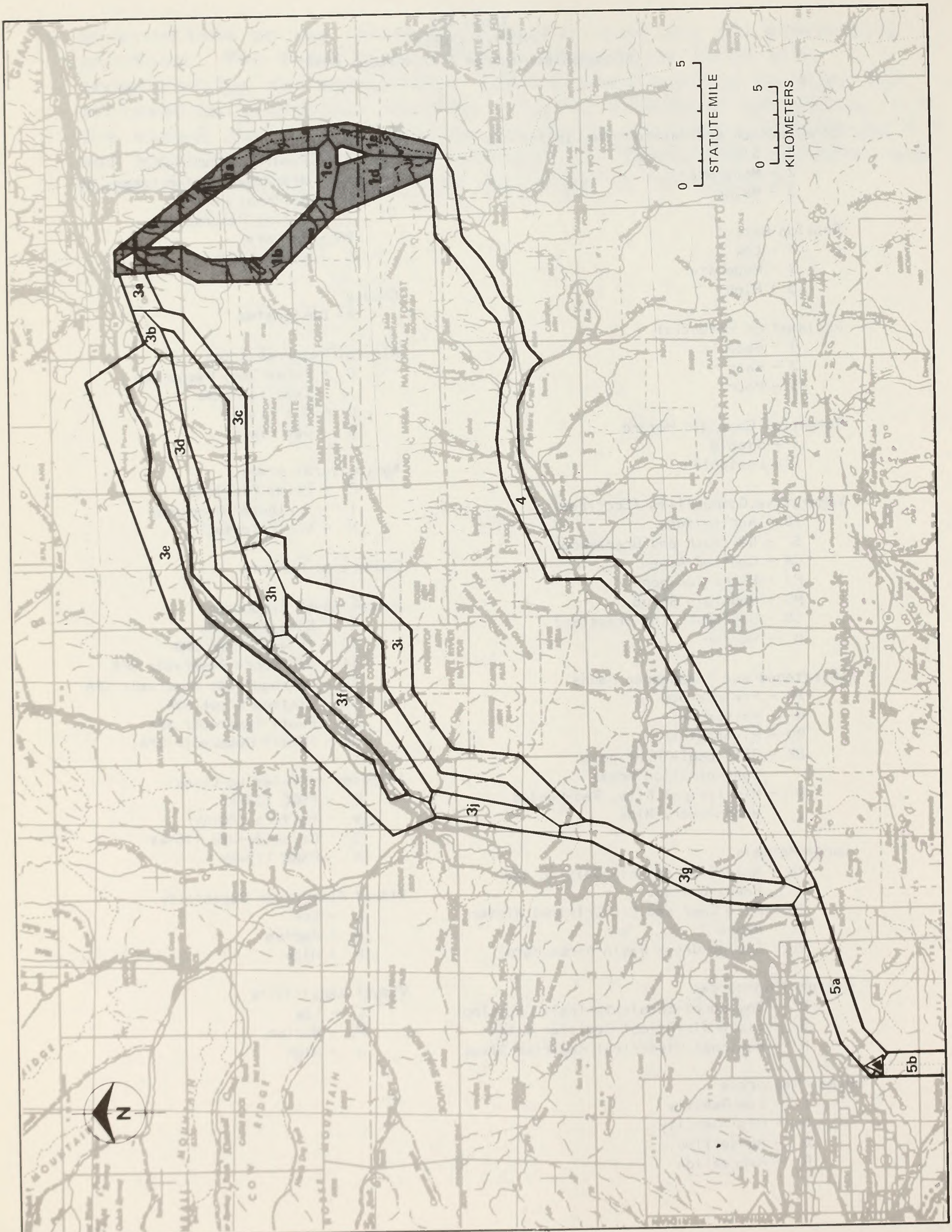
Commercial Forests

Recreational Resources
- 7 - Escalante SWA
- 13 - Island Acres SRA
- 14 - Joe Moore Reservoir SFA
- 18 - Narraguinnep Reservoir SFA
- 22 - Plateau Creek SWA
- 23 - Puett Reservoir SFA
- 24 - Summit Reservoir SFA

Adjacent to Existing Lines
- P - PSCC 230-kV
- W - Western 230-kV
- C - Colorado-Ute 115-kV
- N - PSNM 115-kV

Visual Absorption Capability
- L - Low
- M - Medium
- H - High

Visual Sensitivity
- L - Low
- M - Medium
- H - High


1b
1c
1d
3a
3b
3c
3d
3e
3f
3g
3h
3i
3j
4
5a
5b
0 5
STATUTE MILE
0 5
KILOMETERS
N

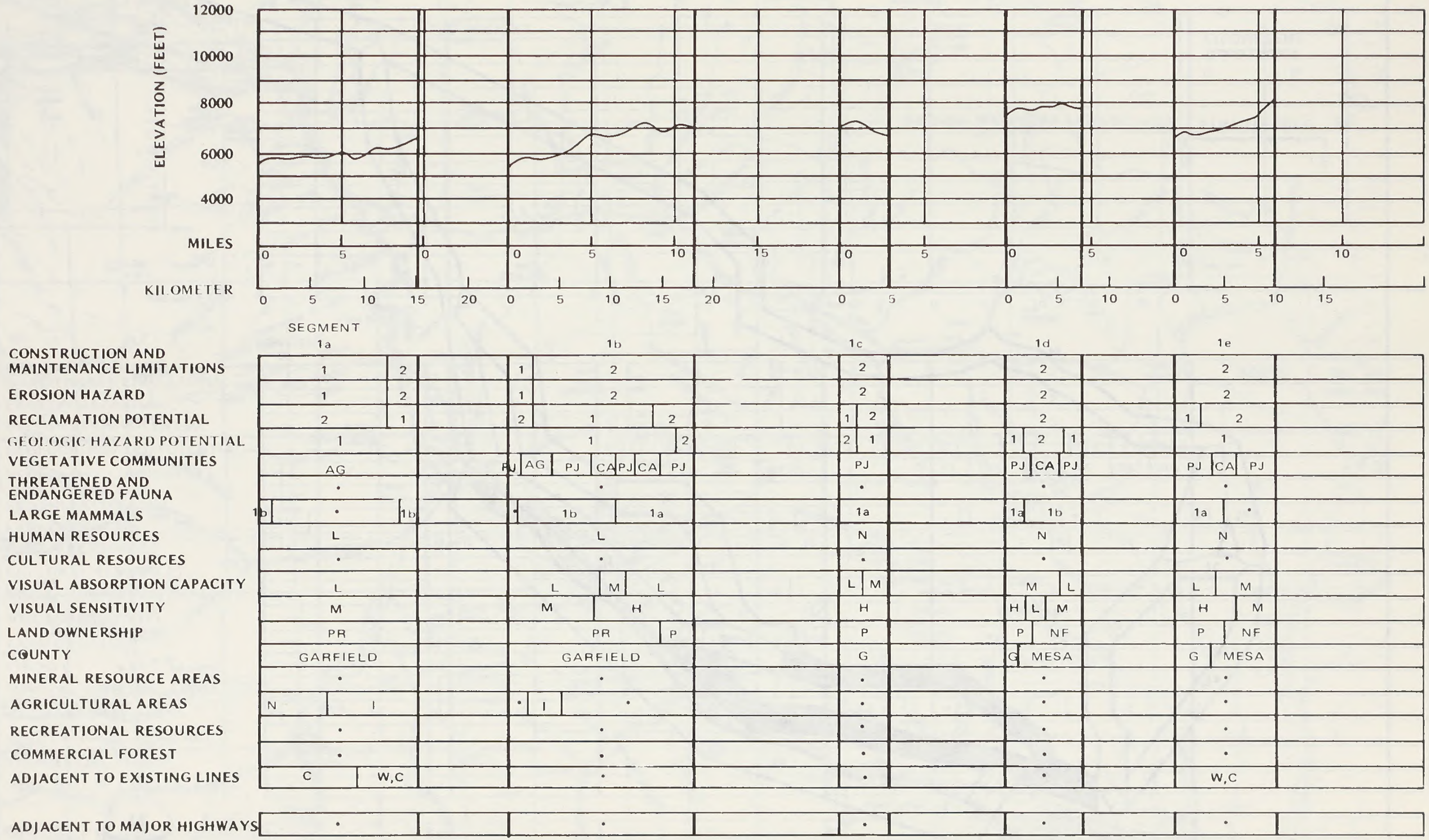
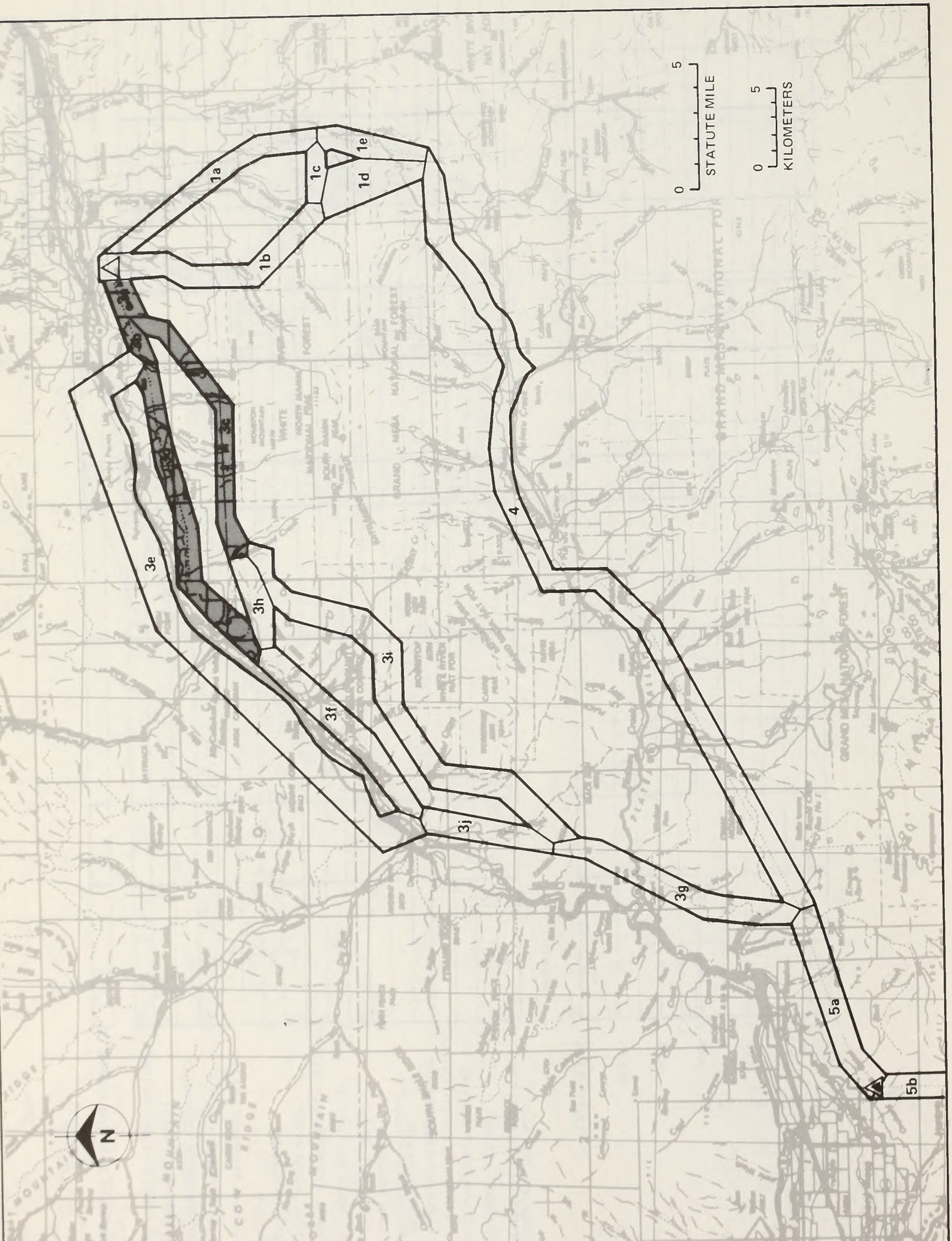
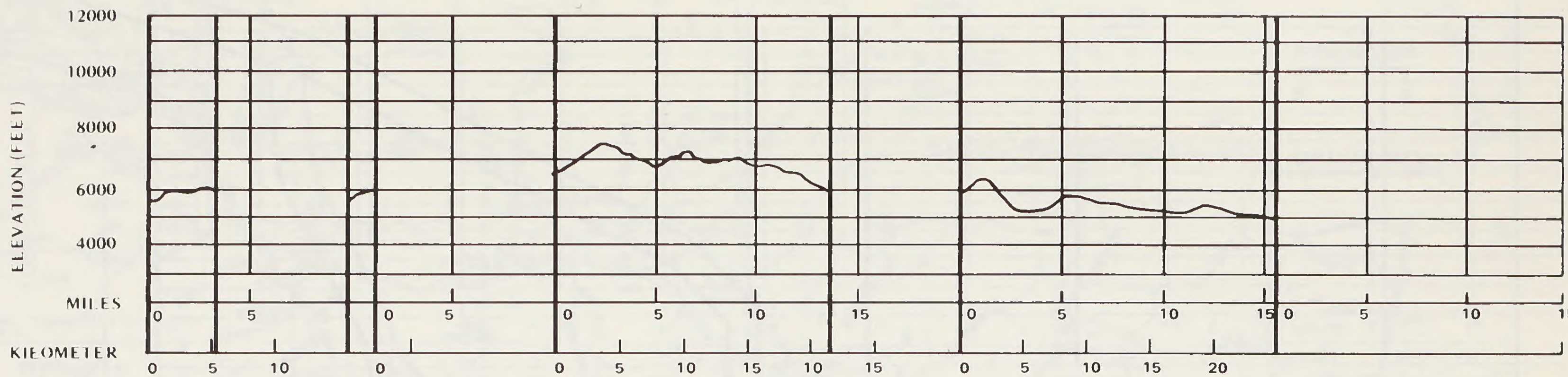


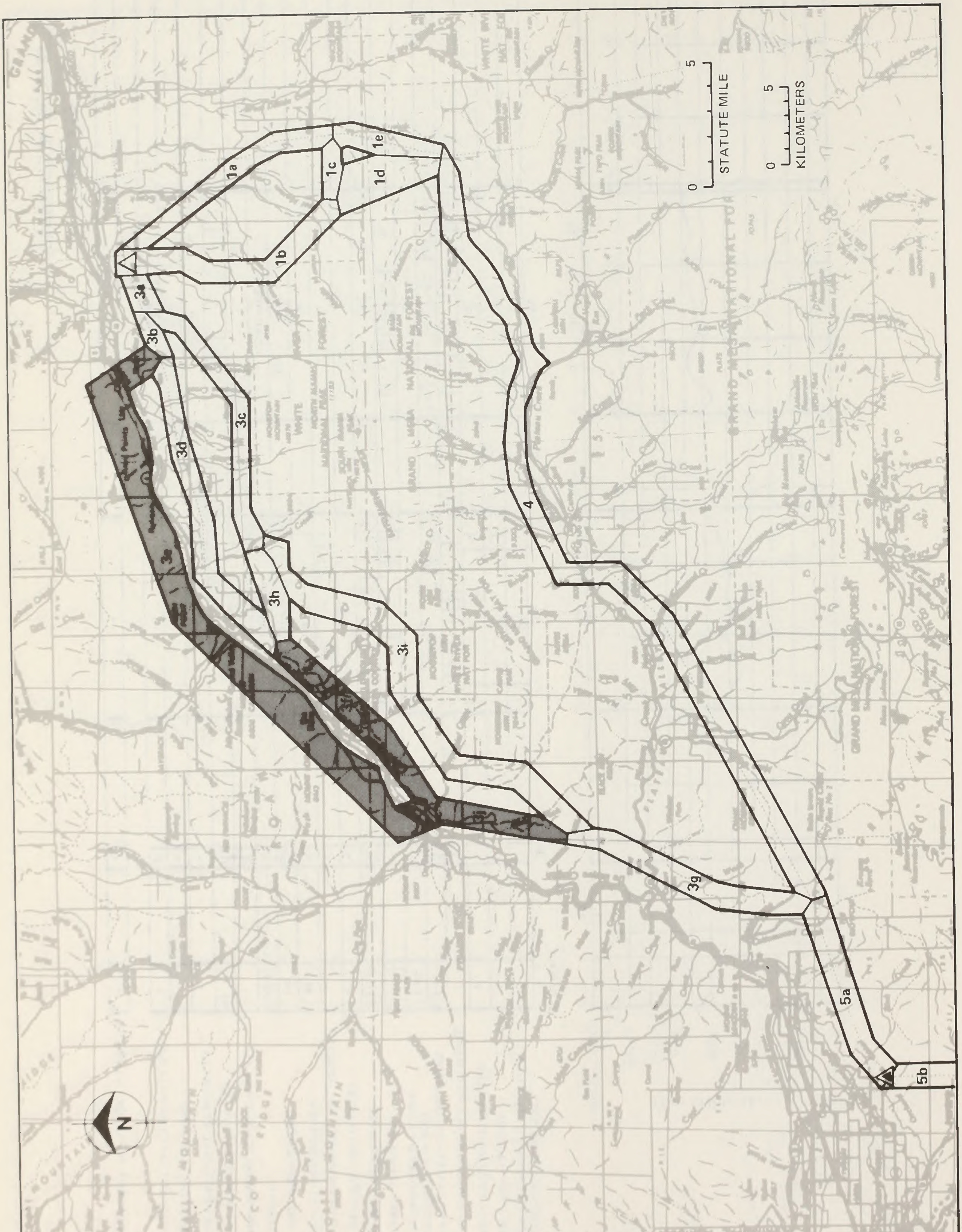
Figure 4-12
SEGMENTS 1a, 1b, 1c, 1d, 1e


1a
1b
1c
1d
1e
3e
3f
3g
3h
3i
3j
4
5a
5b
N
0 5
STATUTE MILE
0 5
KILOMETERS



SEGMENT	3a	3b	3c	3d
CONSTRUCTION AND MAINTENANCE LIMITATIONS	1	1	1 2 1	2
EROSION HAZARD	1	1	1 2 1	2
RECLAMATION POTENTIAL	2	2	2 1 2	3
GEOLOGIC HAZARD POTENTIAL	1	2	2 1 2 1 2 1 2 1 2 1 2	2 1 2 1 2 1 2 1 2
VEGETATIVE COMMUNITIES	MS PJ	AP GJ	PJ CA PJ	PJ AG PJ AG PJ AG
THREATENED AND ENDANGERED FAUNA	• BE	BE	BE •	BE
LARGE MAMMALS	1b •	•	1b 1a 1b 1a 1b	• 1a • 1b 1a 1b 1a 1b
HUMAN RESOURCES	L H L	H L N	N H N L N L	H N H
CULTURAL RESOURCES	•	•	•	•
VISUAL ABSORPTION CAPACITY	L	L	L M L M H M L	L
VISUAL SENSITIVITY	M	M	M H	H
LAND OWNERSHIP	PR	PR P	P PR WP P PR P PR	PR P PR
COUNTY	GARFIELD	G	GARFIELD	GARFIELD
MINERAL RESOURCE AREAS	•	G •	• G	• G •
AGRICULTURAL AREAS	N •	I •	•	• I N • I • I
RECREATIONAL RESOURCES	•	•	•	•
COMMERCIAL FOREST	•	•	•	•
ADJACENT TO EXISTING LINES	P	P	•	P
ADJACENT TO MAJOR HIGHWAYS	•	•	•	•

Figure 4-13
SEGMENTS 3a, 3b, 3c, 3d


1a
1b
1c
1d
1e
3a
3b
3c
3d
3e
3g
3h
3i
4
5a
5b
0 5
STATUTE MILE
0 5
KILOMETERS
N

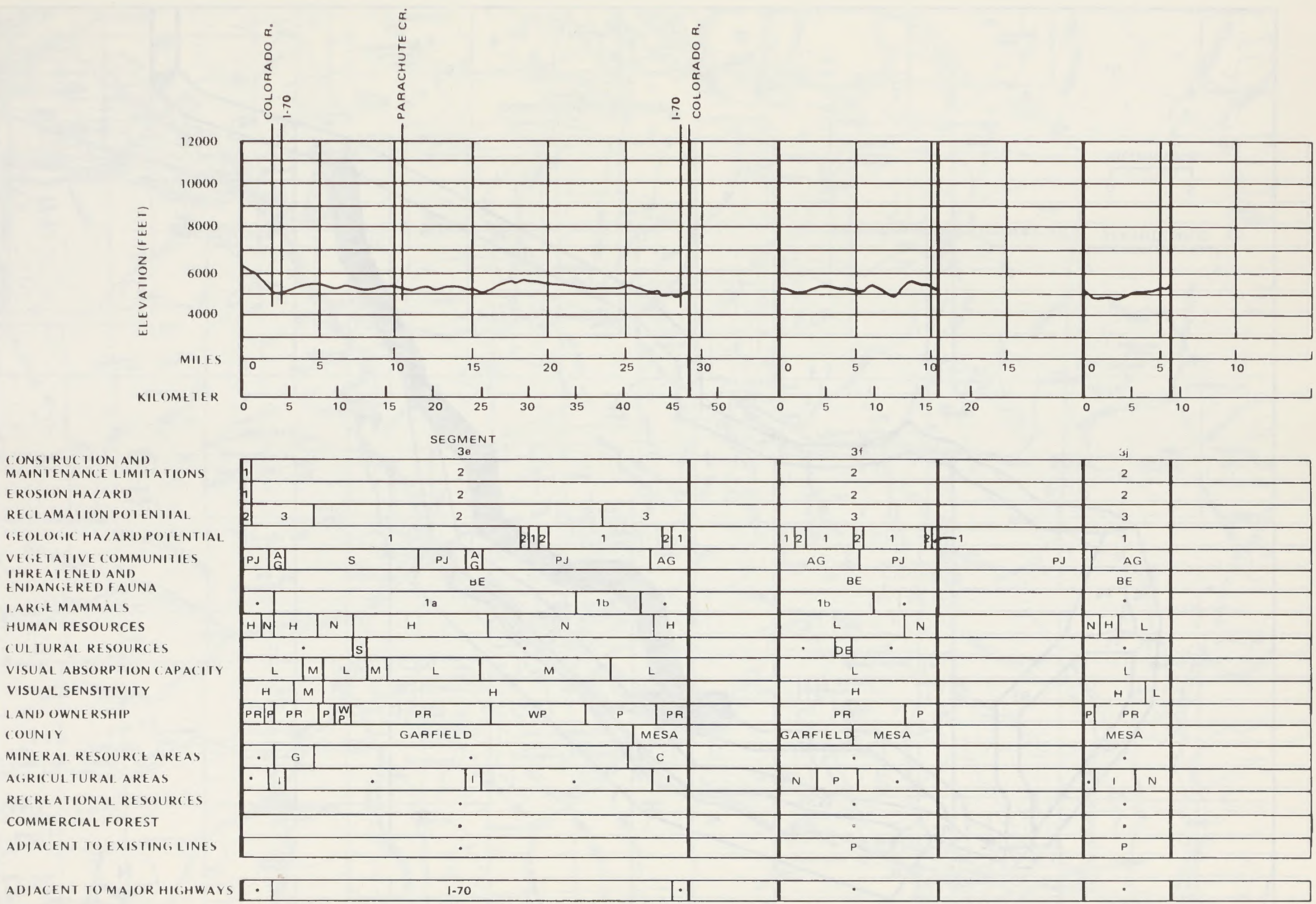
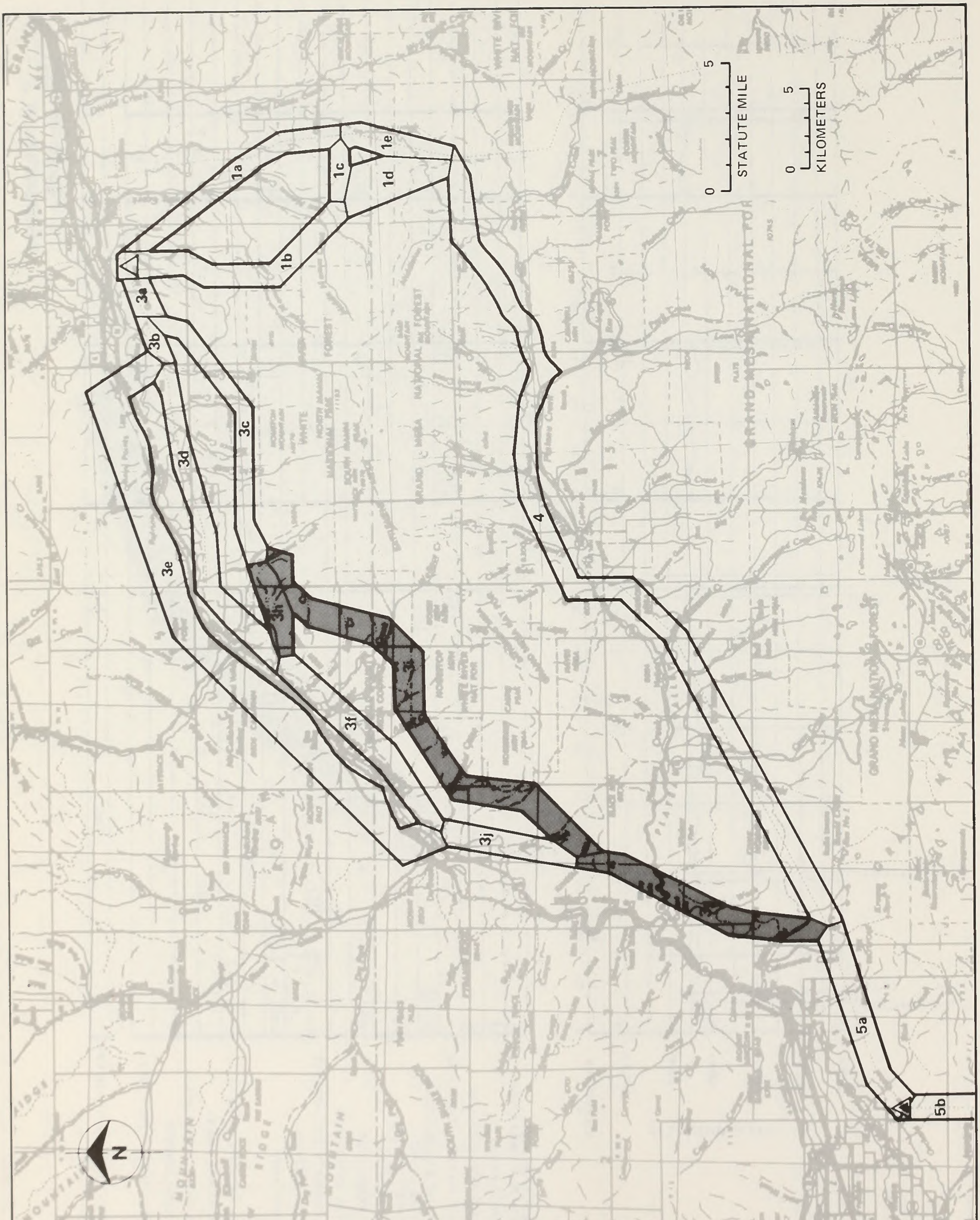


Figure 4-14
SEGMENTS 3e, 3f, 3j


1a
1b
1c
1d
1e
3a
3b
3c
3d
3e
3f
3h
3j
4
5a
5b
0 5
STATUTE MILE
0 5
KILOMETERS
N

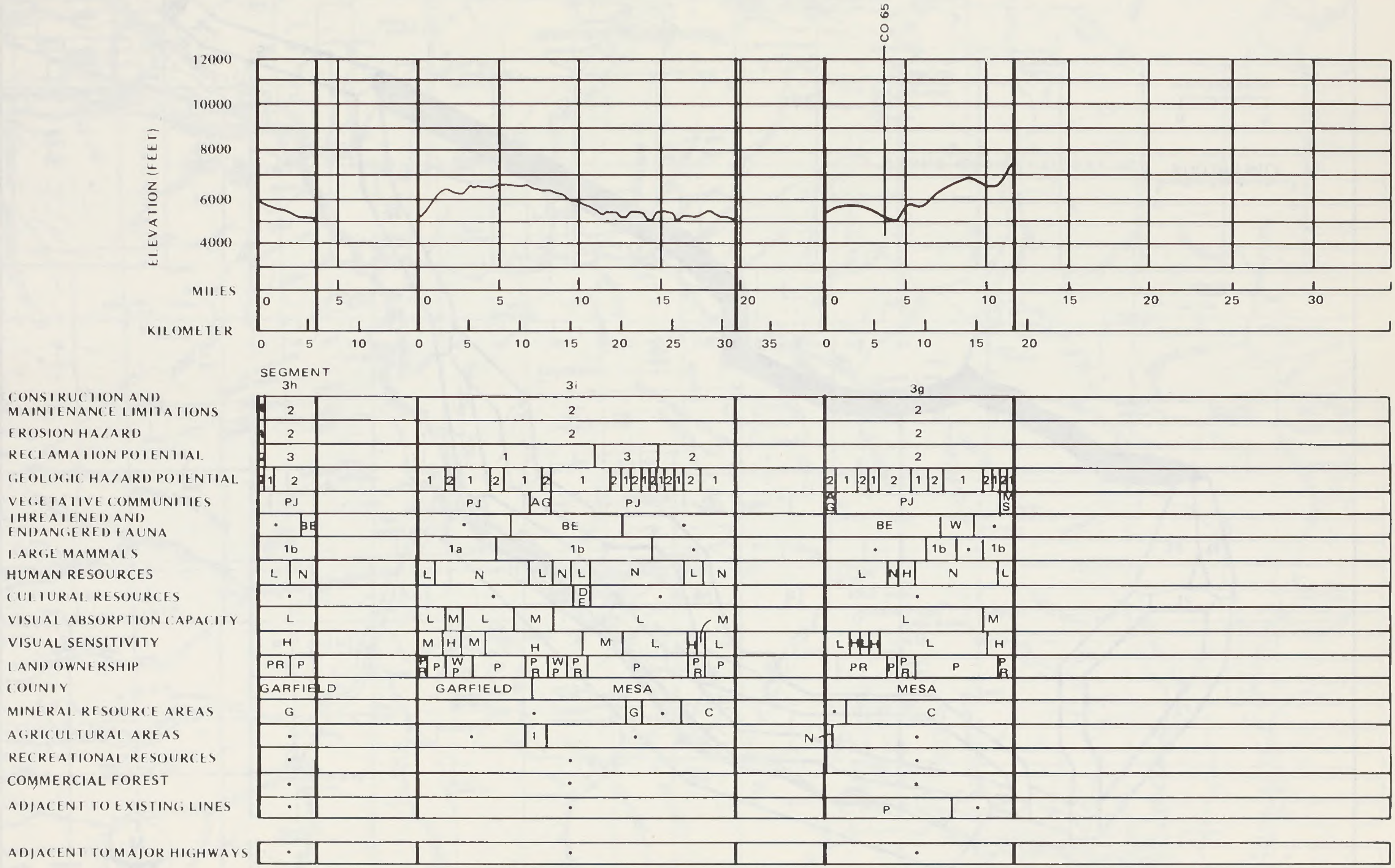
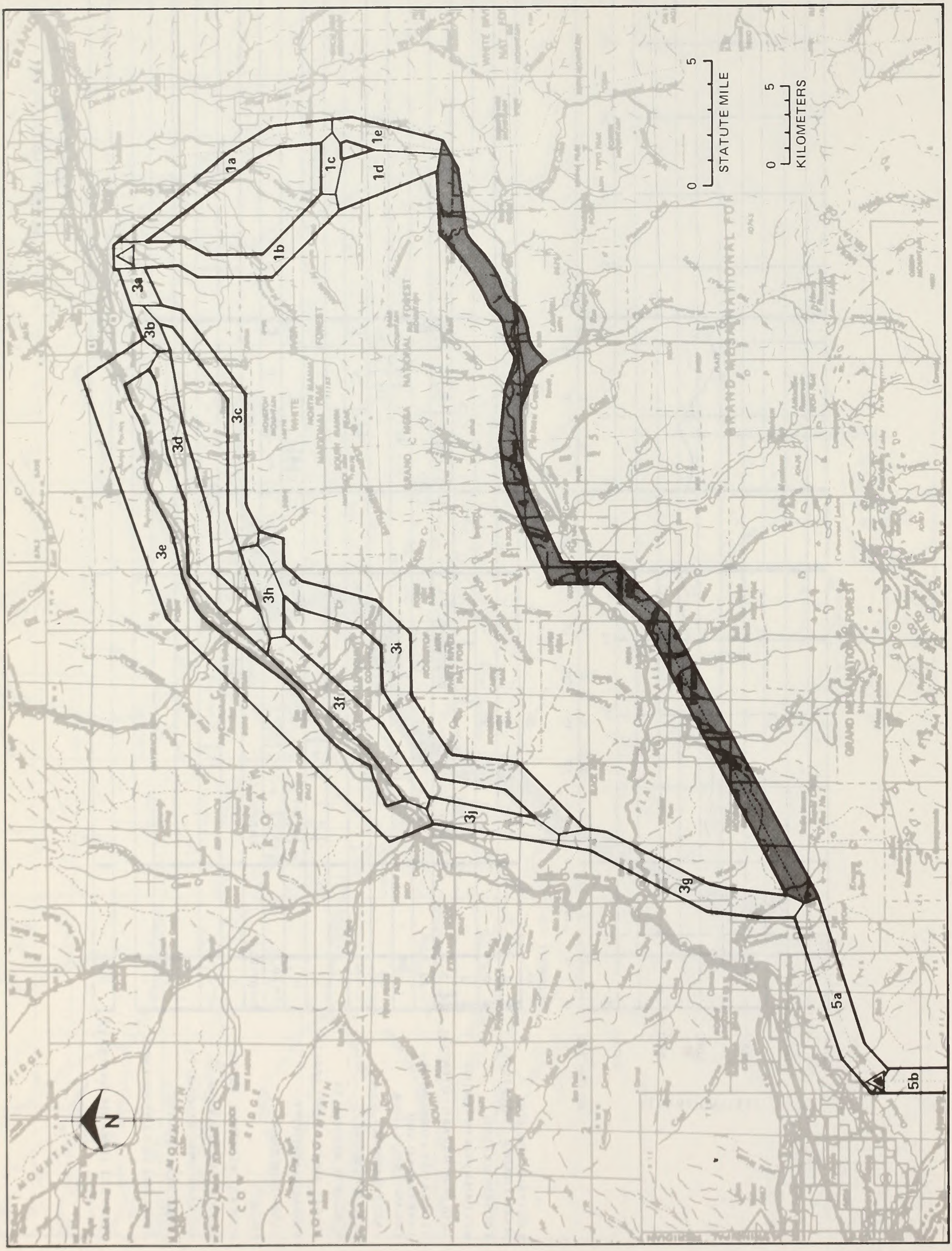


Figure 4-15
SEGMENTS 3h, 3i, 3g


1a
1b
1c
1d
1e
3a
3b
3c
3d
3e
3f
3g
3h
3i
3j
5a
5b
0 5
STATUTE MILE
0 5
KILOMETERS
N

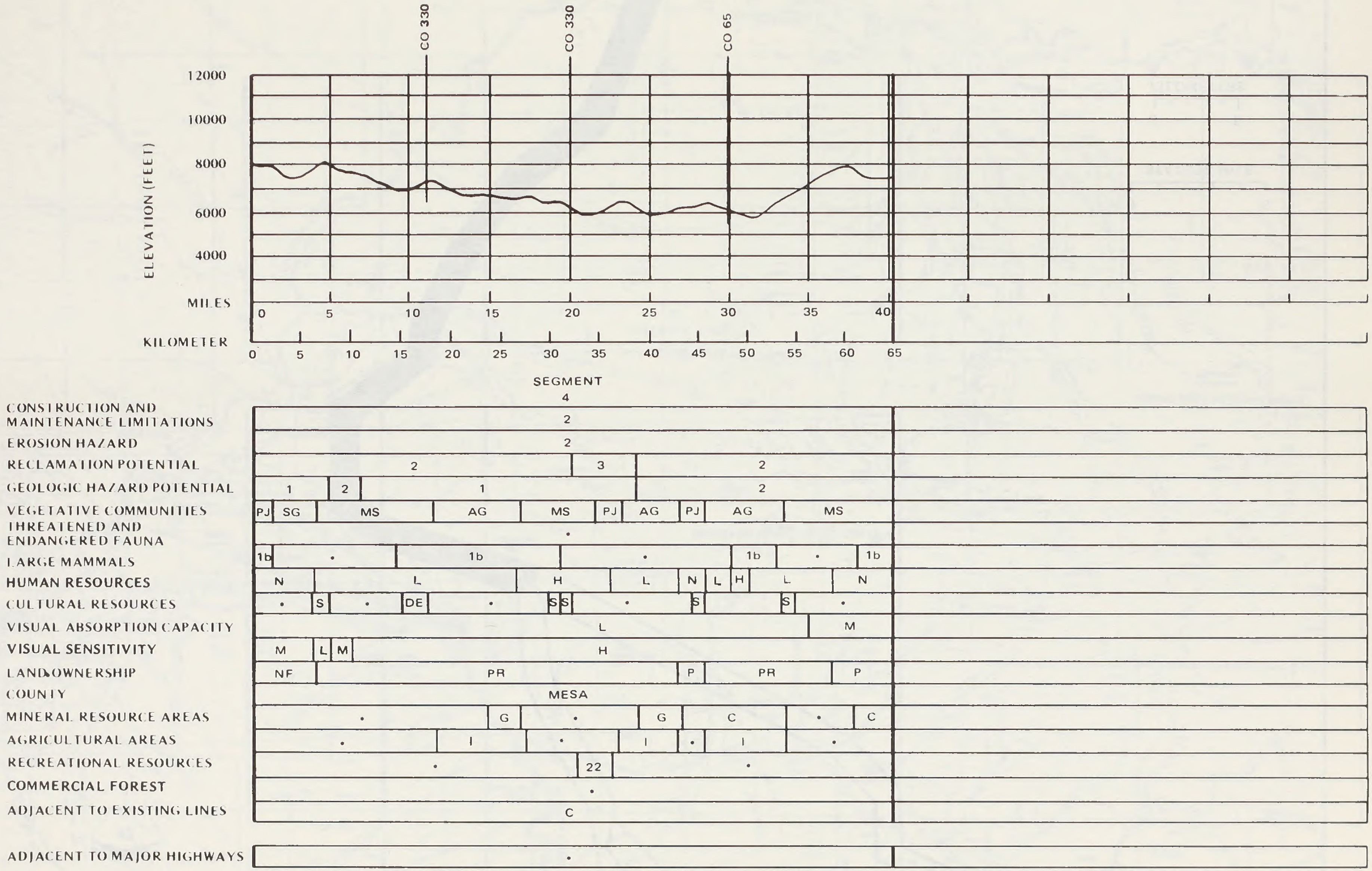
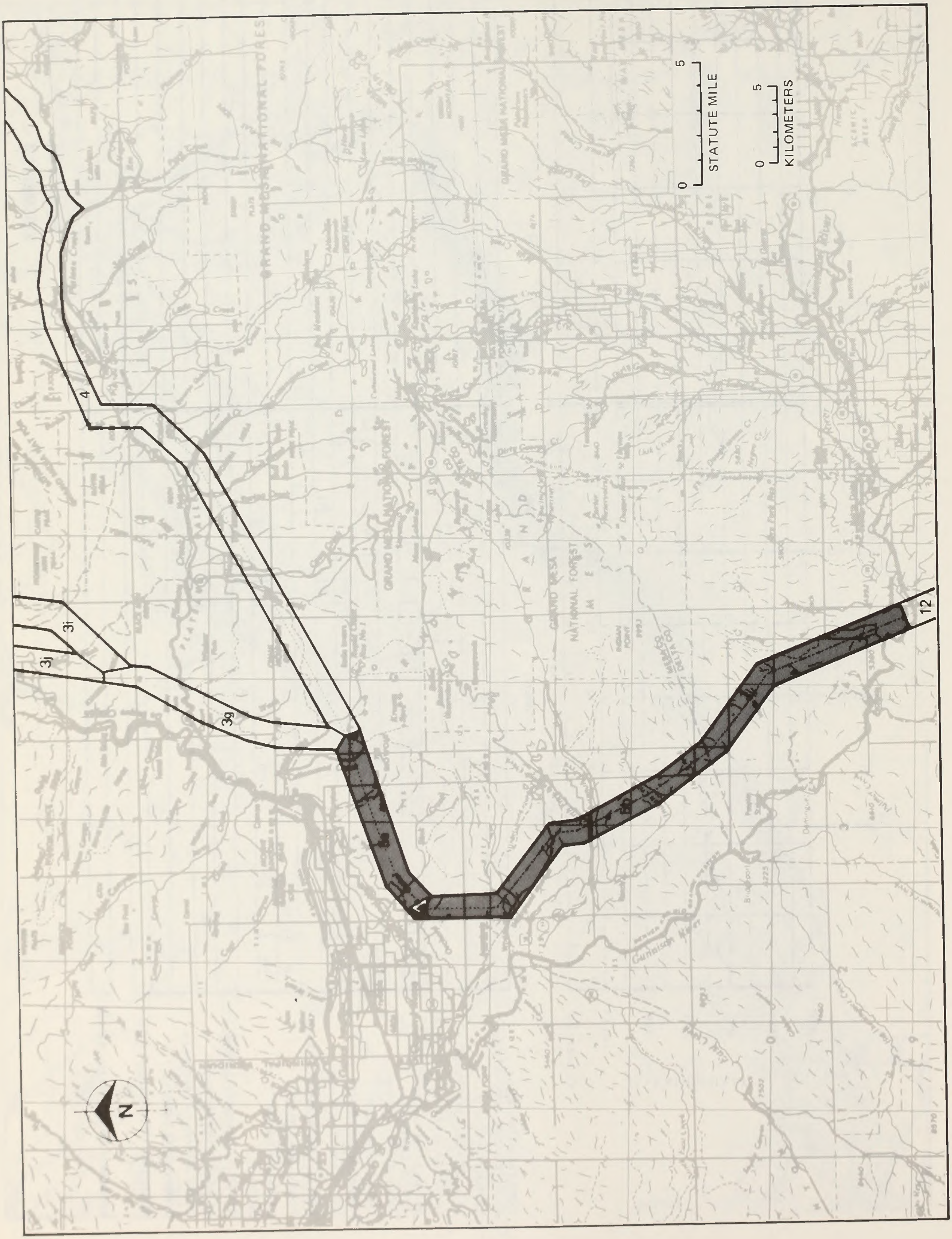


Figure 4-16
SEGMENT 4


4
3g
3i
3j
7
12
N
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STATUTE MILE
0 5
KILOMETERS
GRAND MESA NATIONAL FOREST
Gunnison River

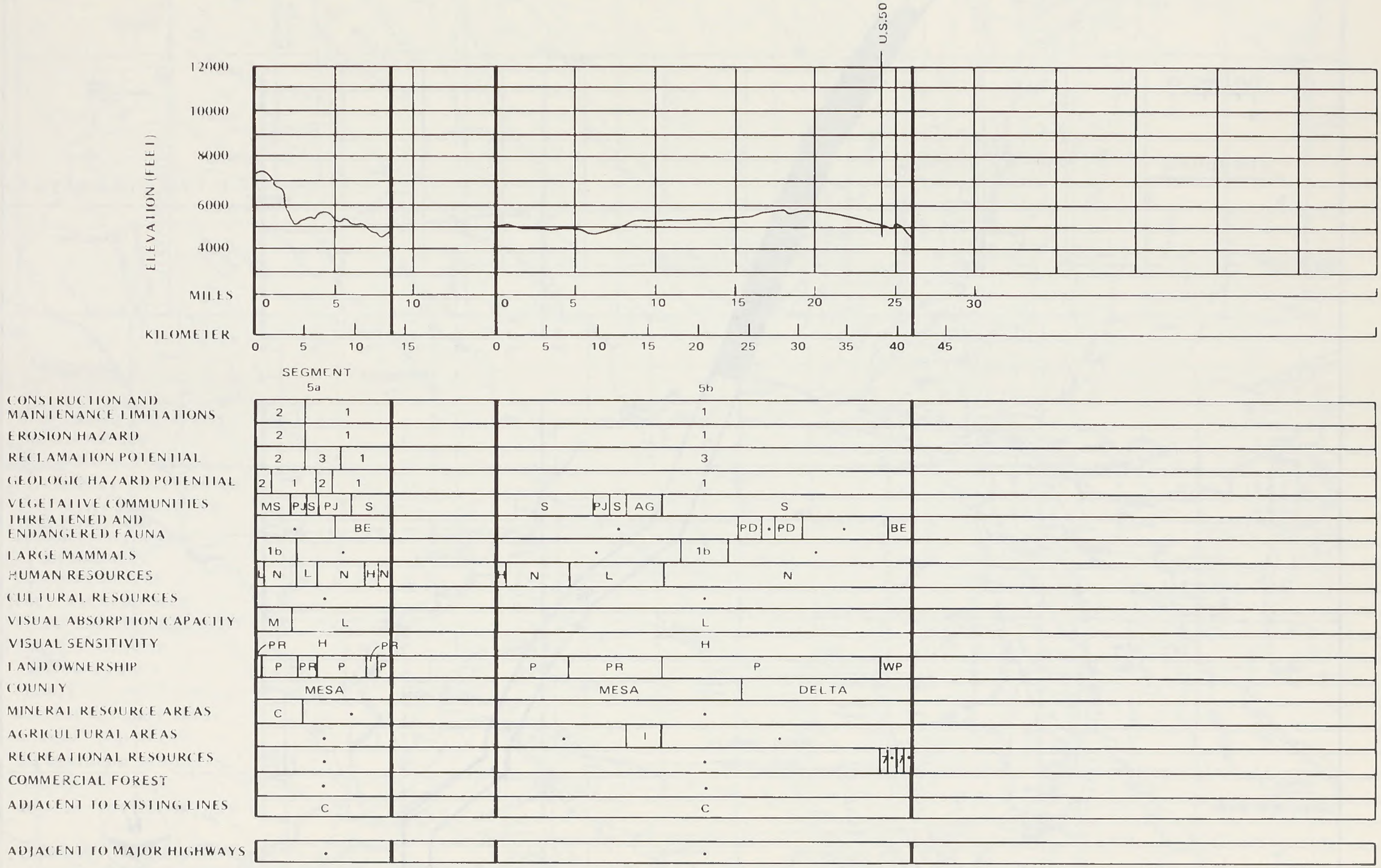
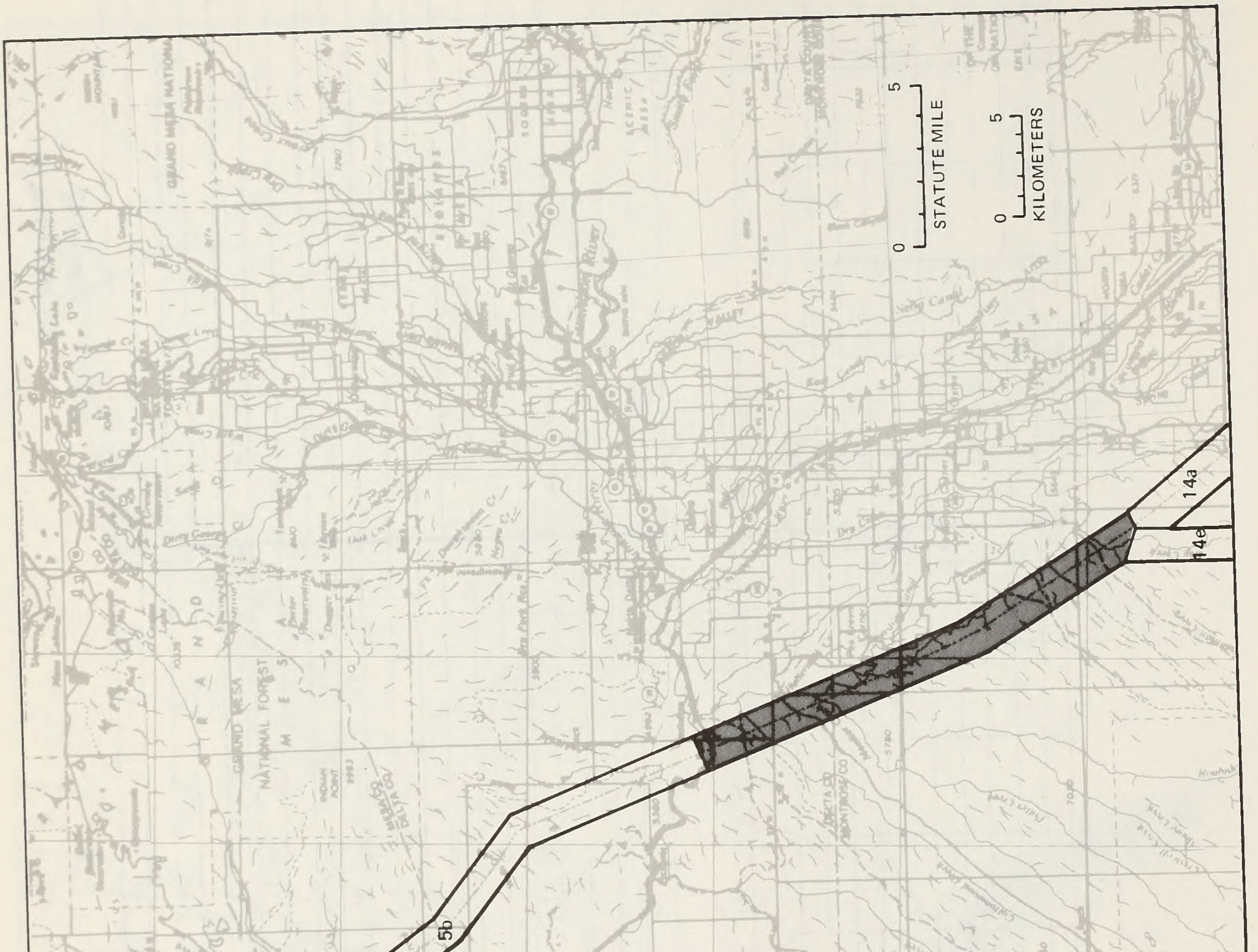
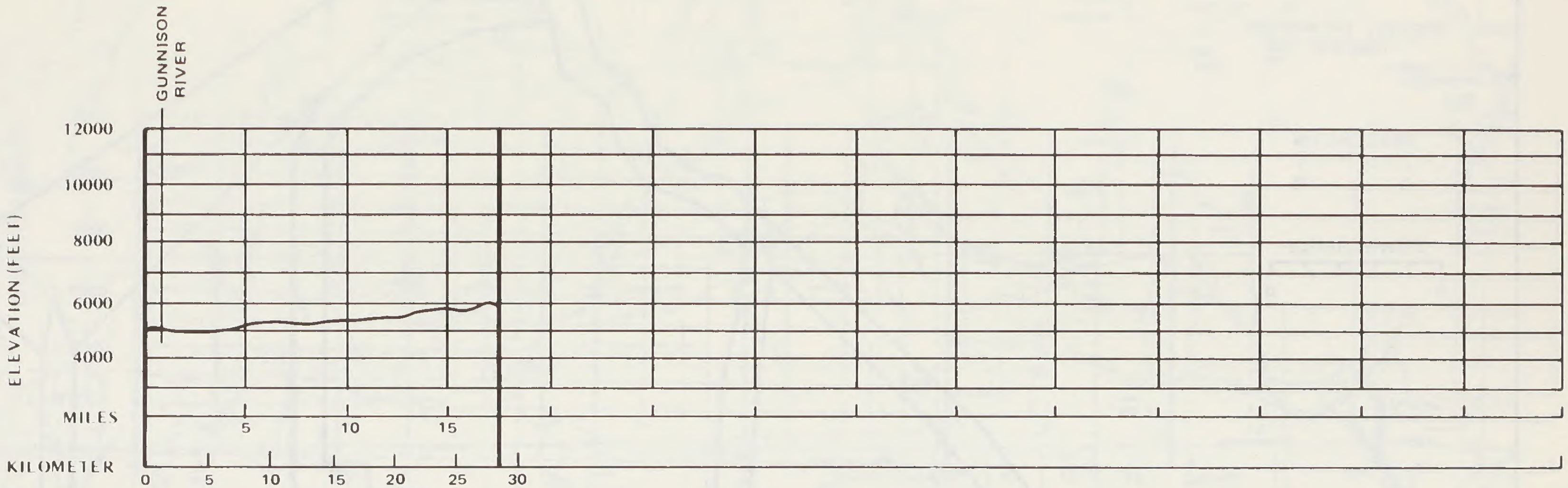


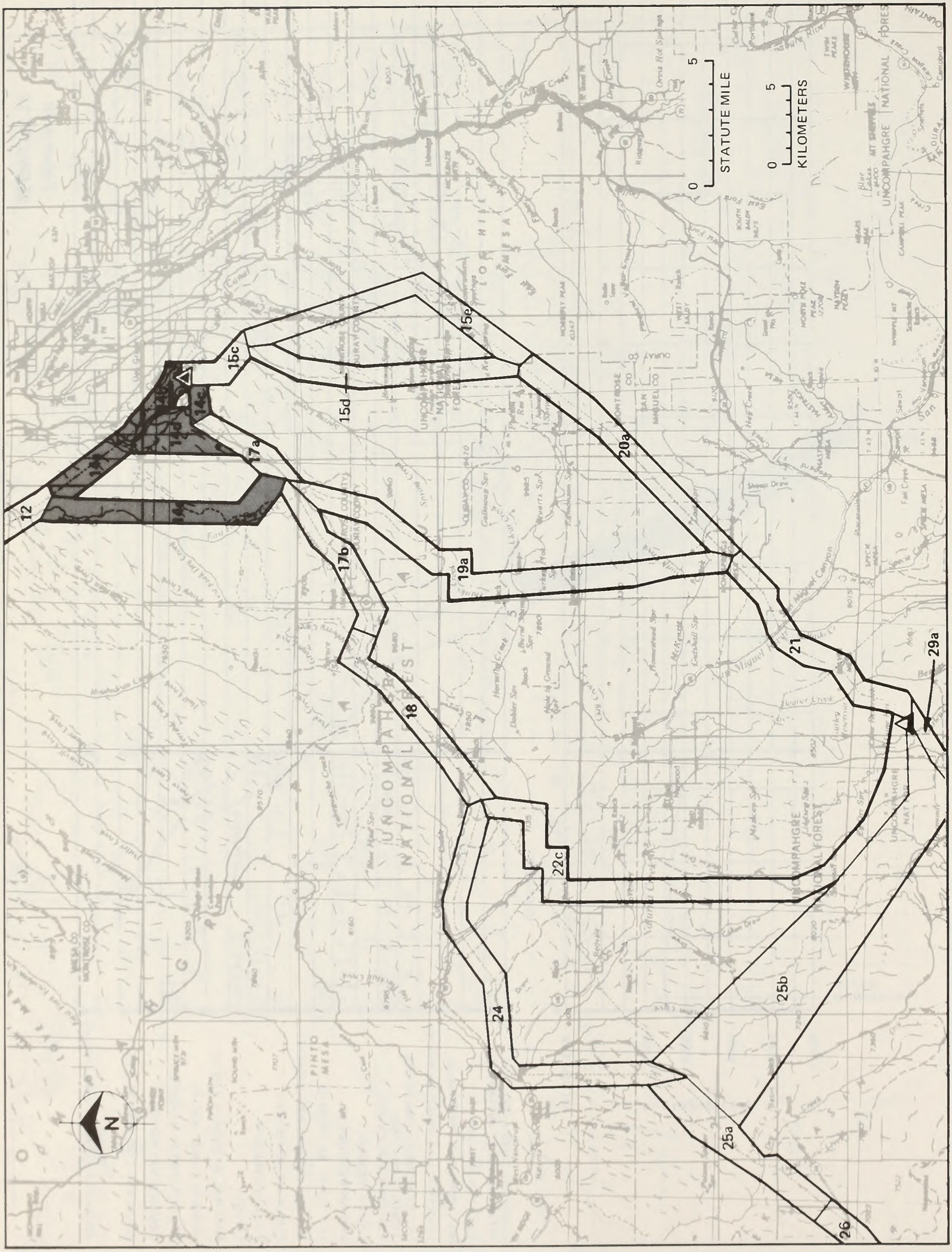
Figure 4-17
SEGMENTS 5a, 5b

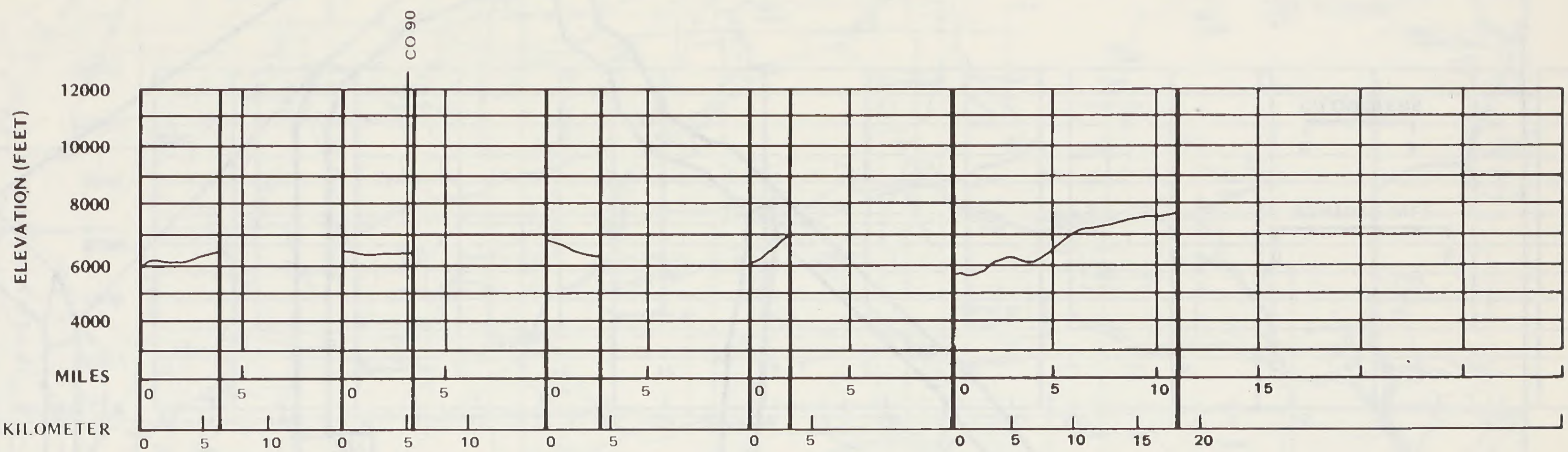

5a
5b
14a
14e
0 5
STATUTE MILE
0 5
KILOMETERS
N
GRAND MESA
NATIONAL FOREST



Attribute	Segment 12 (left to right)
CONSTRUCTION AND MAINTENANCE LIMITATIONS	2 | 3 | 2
EROSION HAZARD	2
RECLAMATION POTENTIAL	2
GEOLOGIC HAZARD POTENTIAL	1
VEGETATIVE COMMUNITIES	S | AG | PJ | AG
THREATENED AND ENDANGERED FAUNA	BE RO | PE | • | PD | BE,PD
LARGE MAMMALS	• | 1b
HUMAN RESOURCES	• | N | L | H | L | N | L
CULTURAL RESOURCES	| S | •
VISUAL ABSORPTION CAPACITY	L
VISUAL SENSITIVITY	H | M | H | M | H
LAND OWNERSHIP	S | P | PR | P | PR
COUNTY	DELTA | MONTROSE
MINERAL RESOURCE AREAS	•
AGRICULTURAL AREAS	• | P | I | • | P
RECREATIONAL RESOURCES	7 | • | 7 | •
COMMERCIAL FOREST	•
ADJACENT TO EXISTING LINES	C
ADJACENT TO MAJOR HIGHWAYS	•

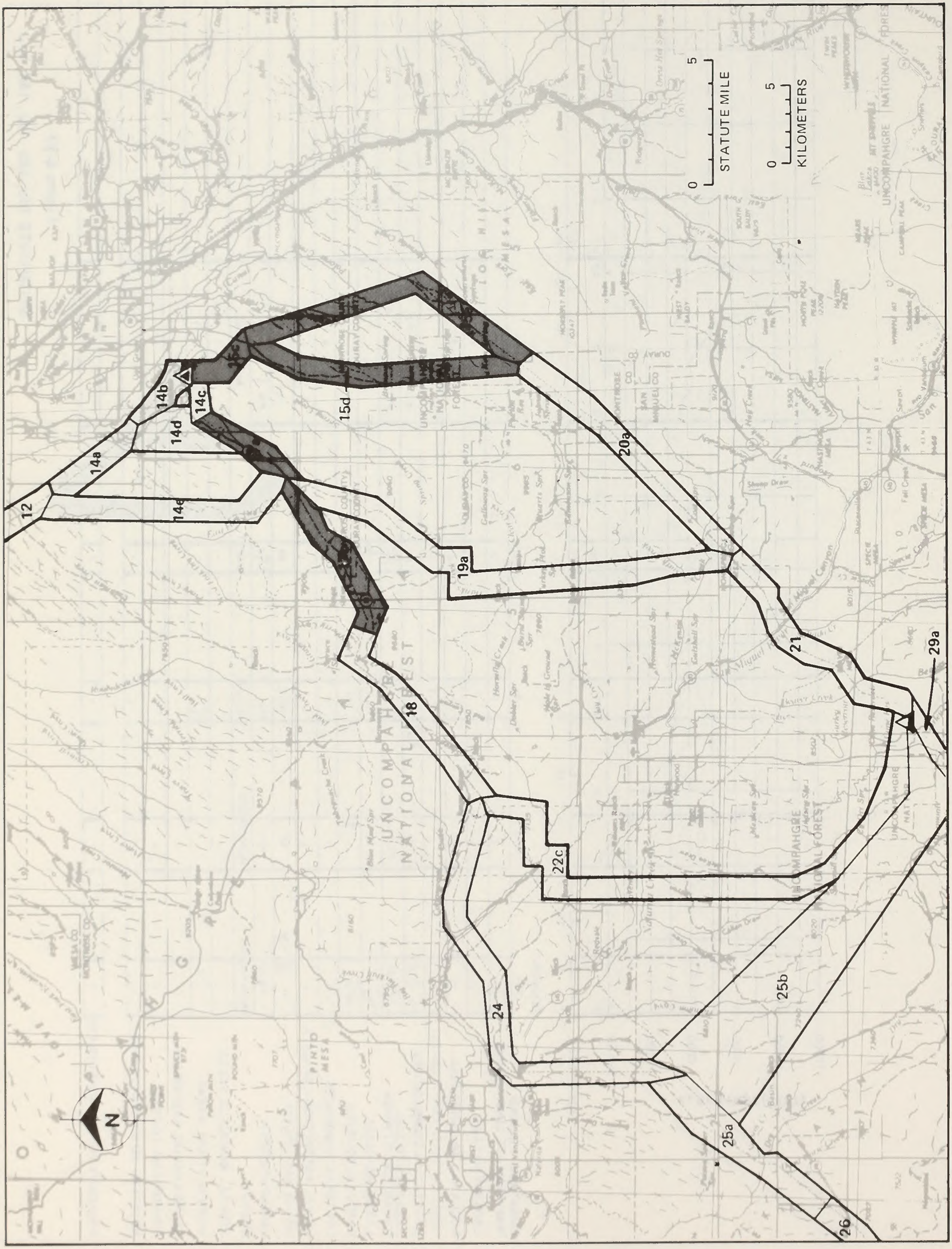
Figure 4-18
SEGMENT 12


12
14c
15c
15d
15e
17a
17b
18
19a
20a
21
22c
24
25a
25b
26
29a
UNCOMPAHGRE NATIONAL FOREST
0 STATUTE MILE 5
0 KILOMETERS 5
N



SEGMENT	14a	14b	14c	14d	14e
CONSTRUCTION AND MAINTENANCE LIMITATIONS	2	2	2	2	2
EROSION HAZARD	2	2	2	2	2
RECLAMATION POTENTIAL	2	2	2	2	2
GEOLOGIC HAZARD POTENTIAL	1	1	2 | 1	2	1 | 2 | 1
VEGETATIVE COMMUNITIES	PJ | AG	AG	AG | PJ	PJ	AG | PJ
THREATENED AND ENDANGERED FAUNA	BE,PD	BE,PD	BE,PD	BE PD	PD,BE | BE
LARGE MAMMALS	1b | •	1a	1a	• | 1b	1b | •
HUMAN RESOURCES	N | L	L | H	H	L | N	L | N
CULTURAL RESOURCES	•	•	•	•	•
VISUAL ABSORPTION CAPACITY	L	L	L	L	L
VISUAL SENSITIVITY	H | L | M	M	M | L	M	M | H
LAND OWNERSHIP	P | PR	PR	PR	PR | P	PR | P
COUNTY	MONTROSE	MONTROSE	MONT	MONT	MONTROSE
MINERAL RESOURCE AREAS	•	•	•	•	•
AGRICULTURAL AREAS	• | P	I	I | •	•	N | •
RECREATIONAL RESOURCES	•	•	•	•	•
COMMERCIAL FOREST	•	•	•	•	•
ADJACENT TO EXISTING LINES	C	C	C	•	•
ADJACENT TO MAJOR HIGHWAYS	•	•	•	•	•

Figure 4-19
SEGMENTS 14a, 14b, 14c, 14d, 14e


12
14a
14b
14c
14d
14e
15d
18
19a
20a
21
22c
24
25a
25b
26
29a
0 5 STATUTE MILE
0 5 KILOMETERS
N
UNCOMPAHGRE NATIONAL FOREST

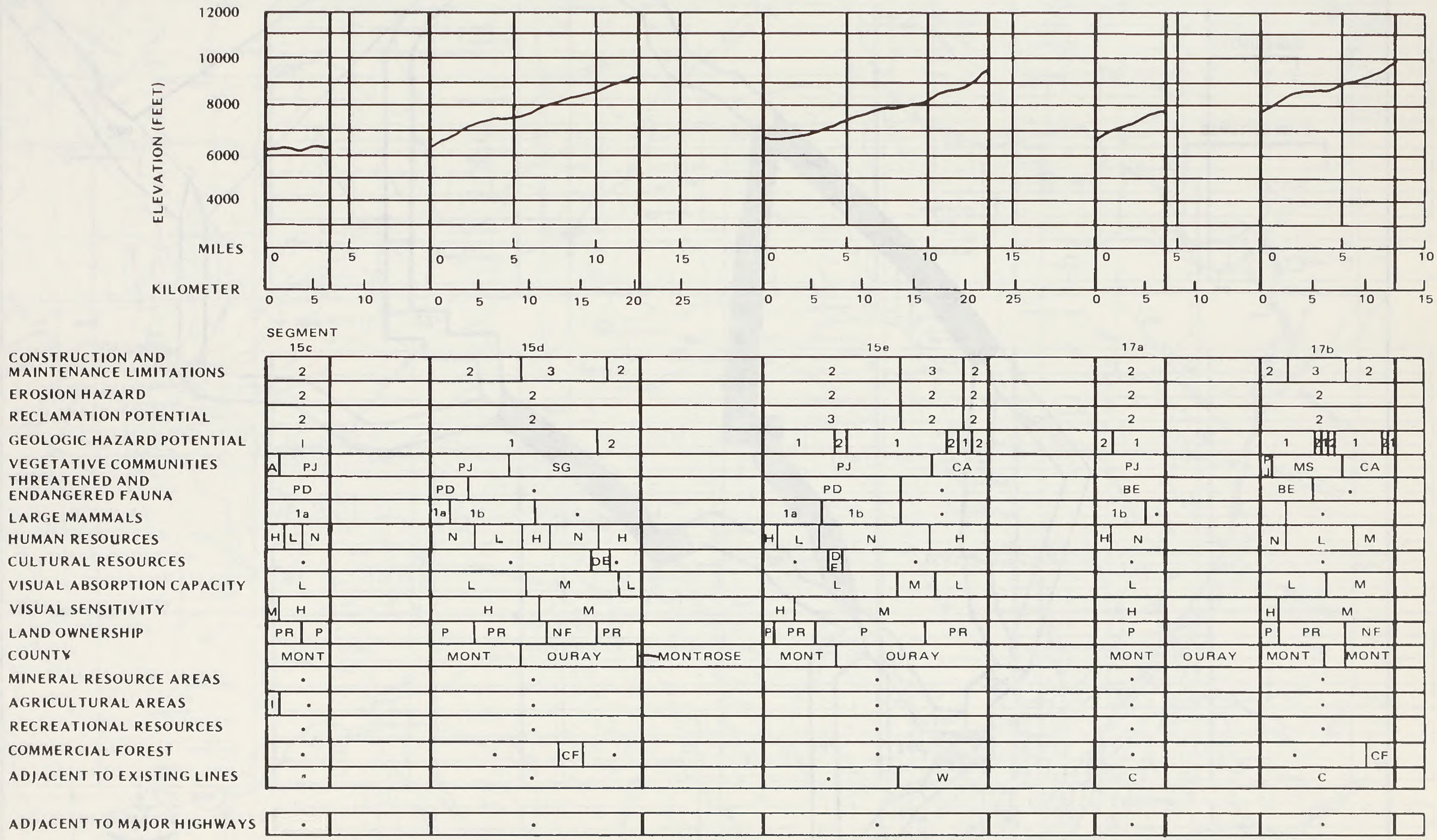
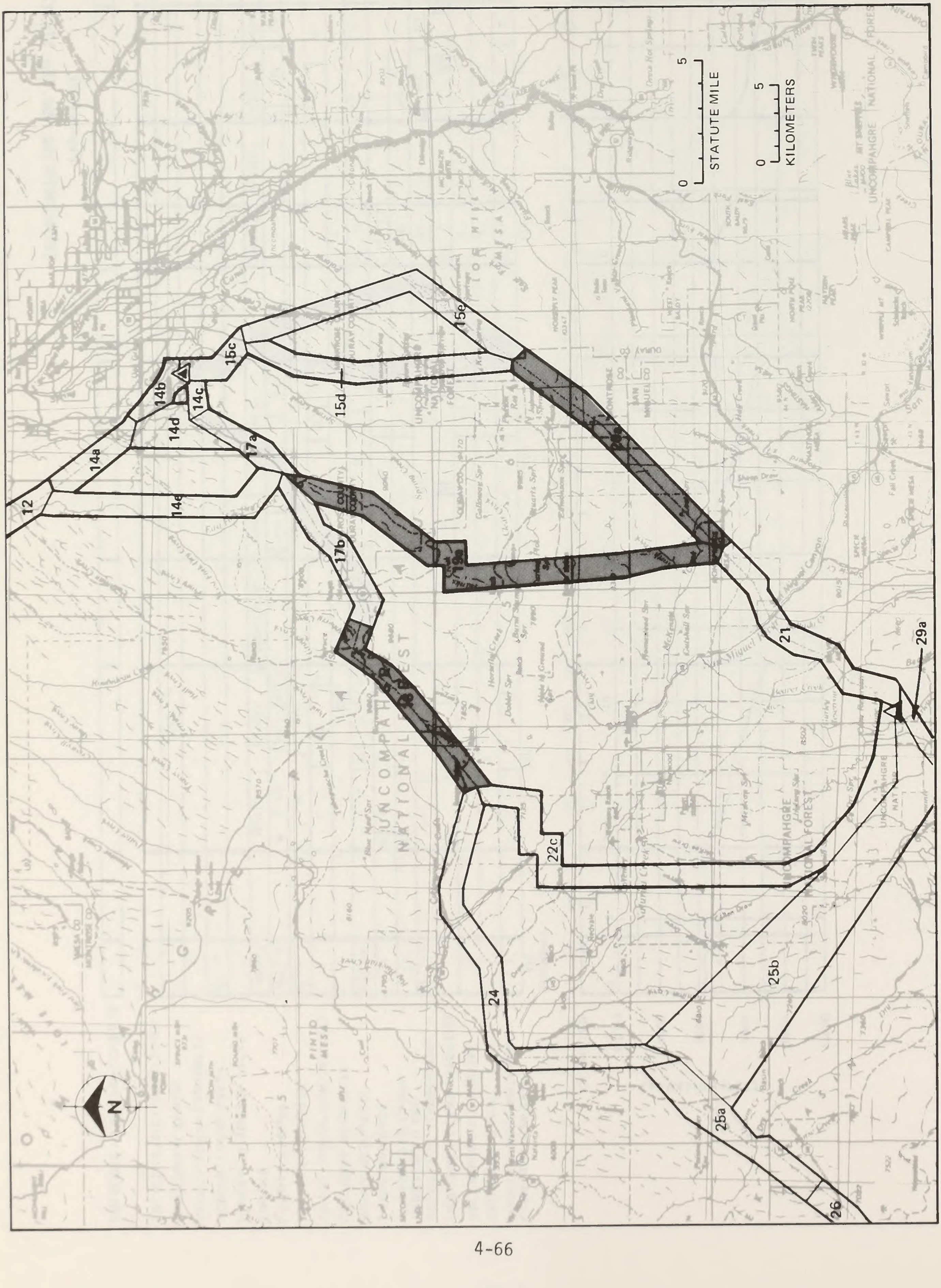


Figure 4-20
SEGMENTS 15c, 15d, 15e, 17a, 17b


12
14a
14b
14c
14d
14e
15c
15d
15e
17a
17b
19a
21
22c
24
25a
25b
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29a
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0 5 KILOMETERS
N

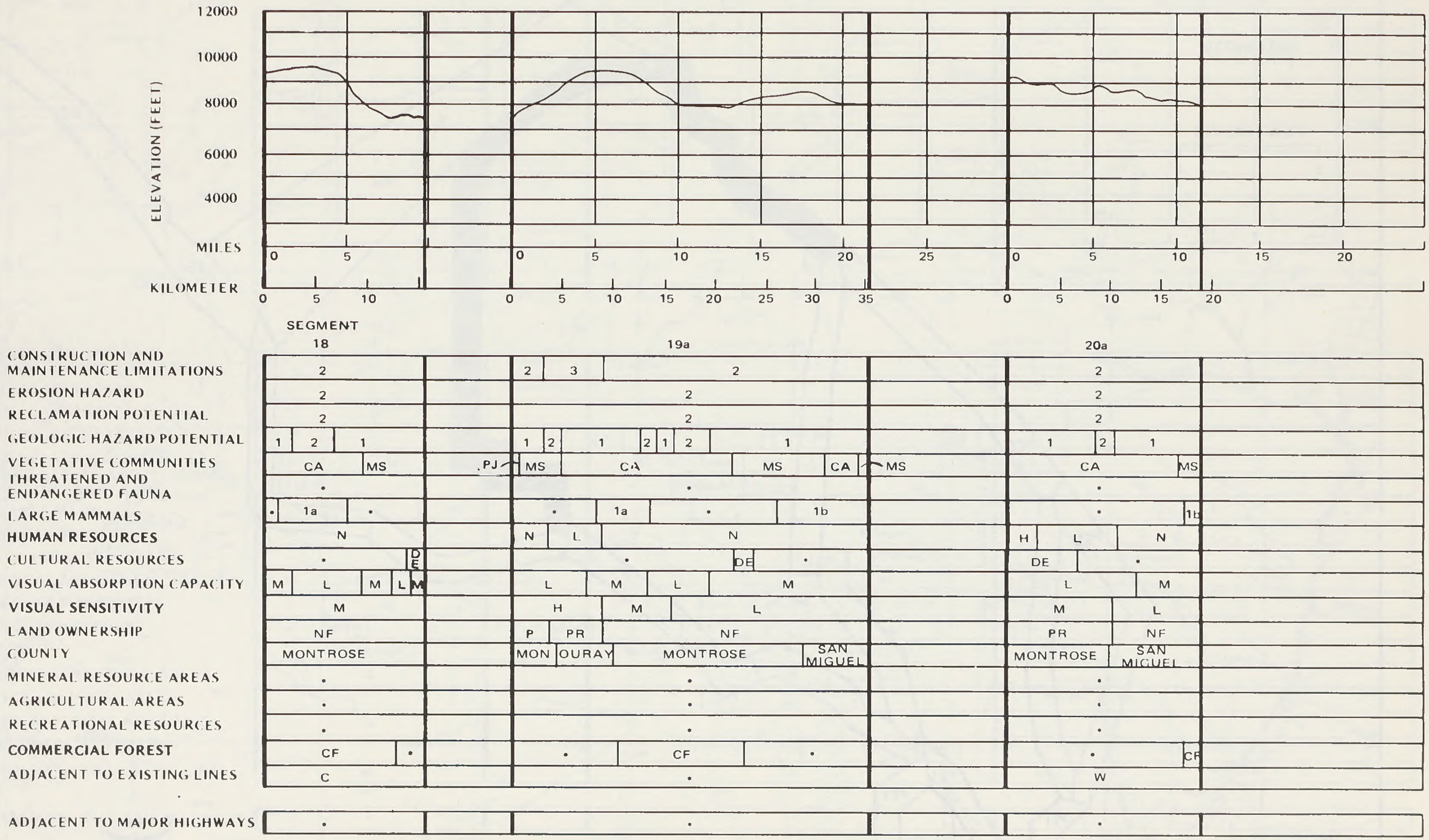
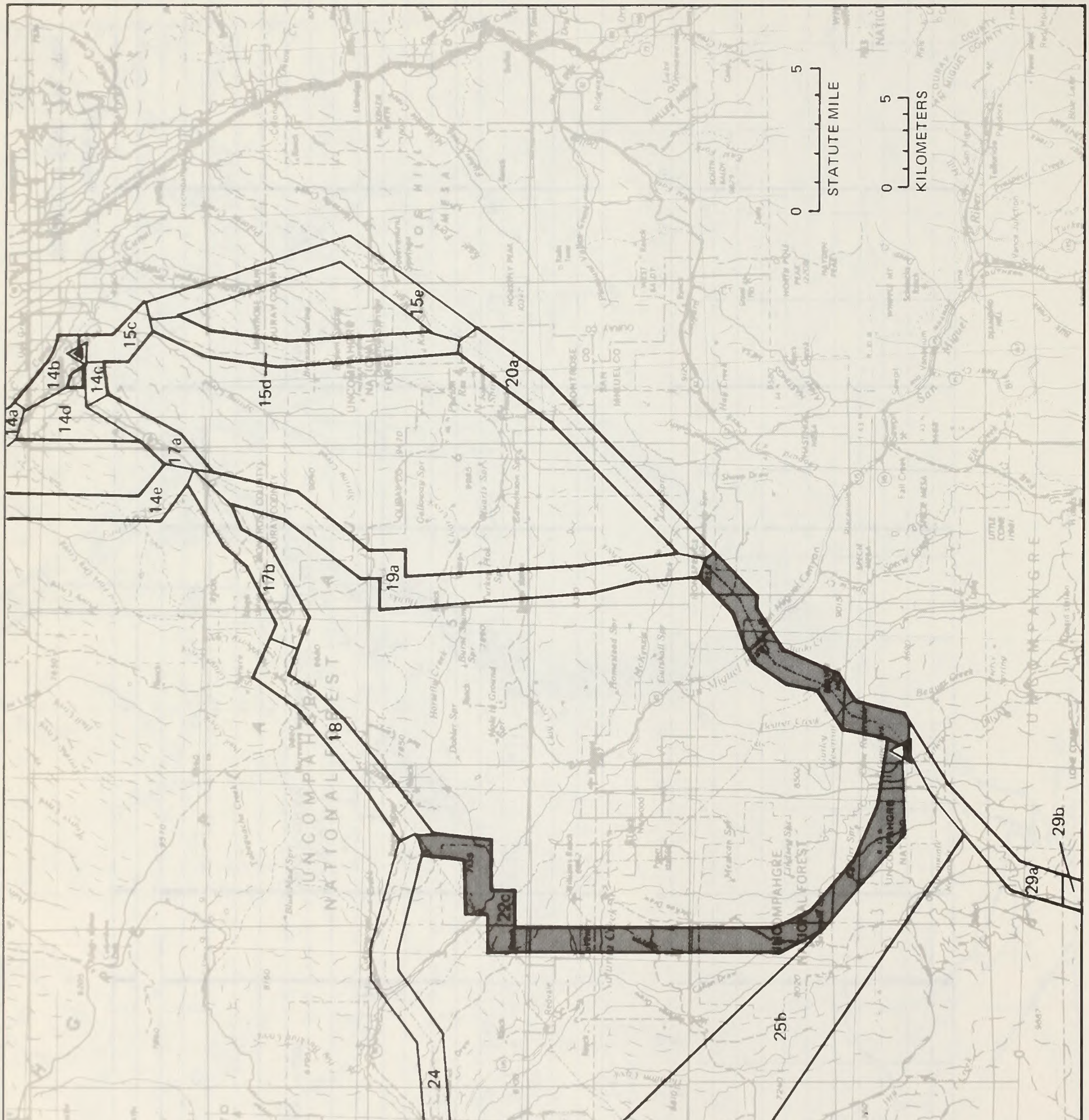


Figure 4-21
SEGMENTS 18, 19a, 20a


14a
14b
14c
14d
14e
15c
15d
15e
17a
17b
18
19a
20a
24
25a
25b
26
29a
29b
UNCOMPAHGRE NATIONAL FOREST
STATUTE MILE
0
5
KILOMETERS
0
5
N

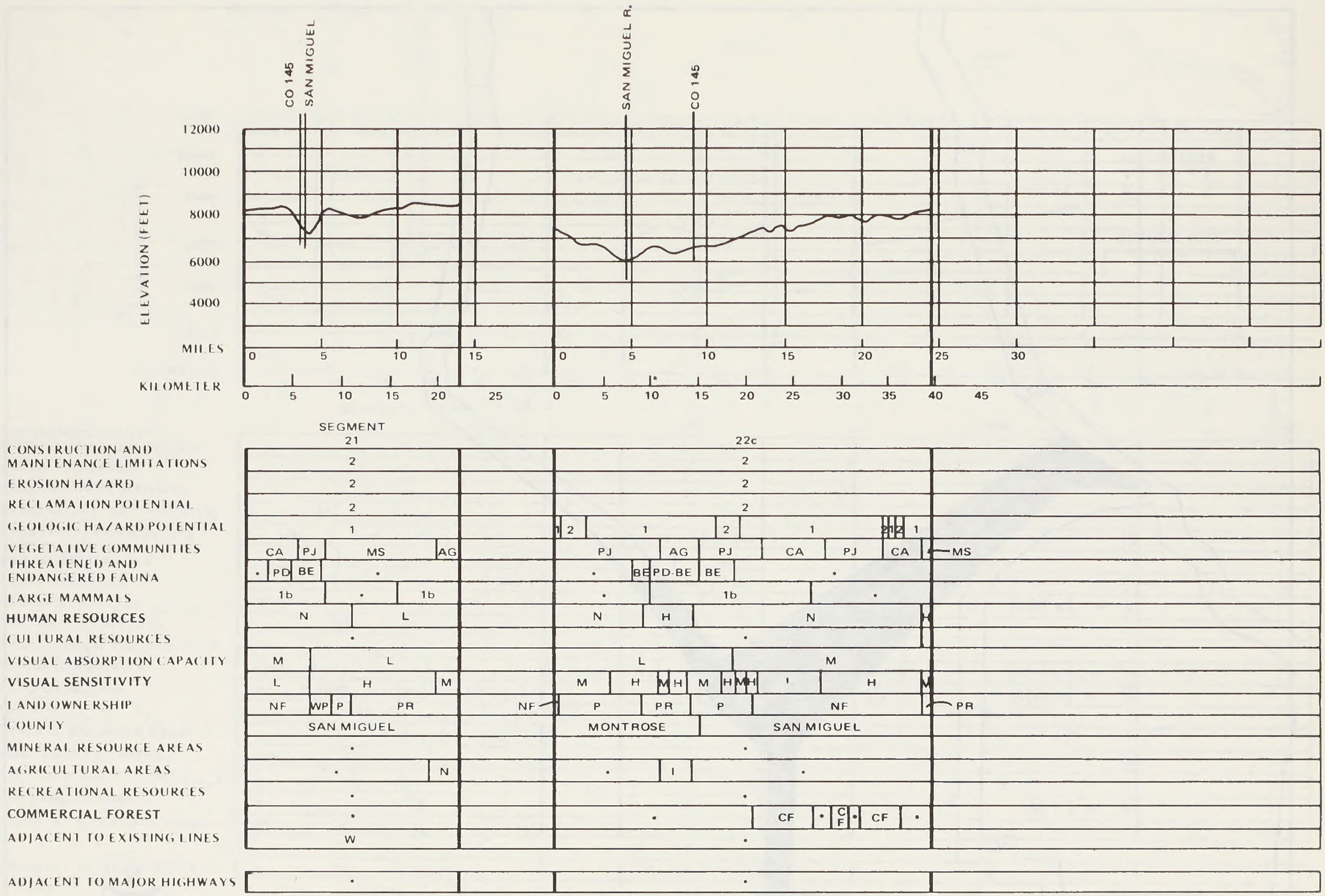
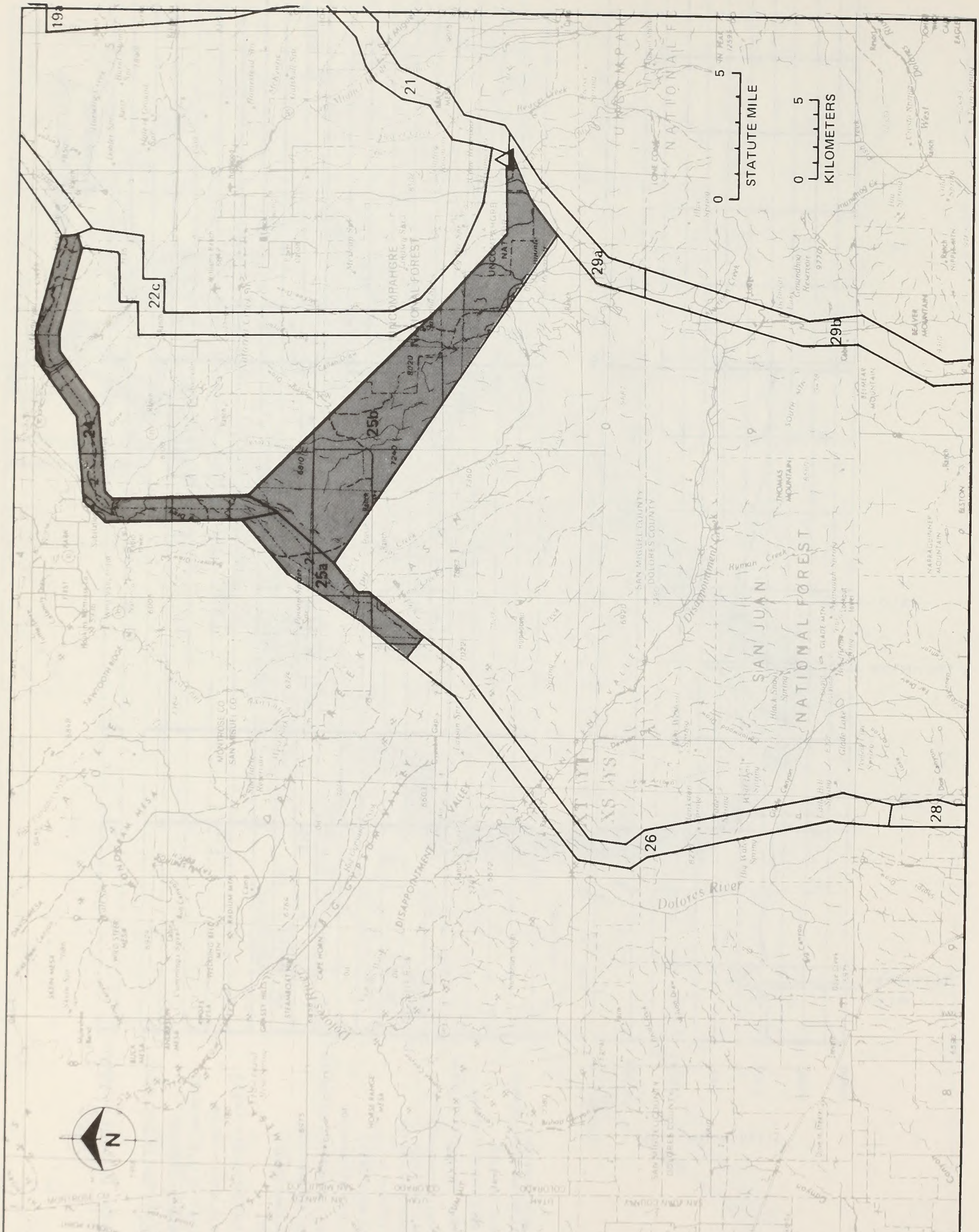


Figure 4-22
SEGMENTS 21, 22c


19
21
22c
24
25a
25b
26
28
29a
29b
0 5
STATUTE MILE
0 5
KILOMETERS
SAN JUAN
NATIONAL FOREST
UNCOMPAHGRE
NATIONAL FOREST
Dolores River
Disappointment Creek
SAN MIGUEL COUNTY
DOLORES COUNTY
N

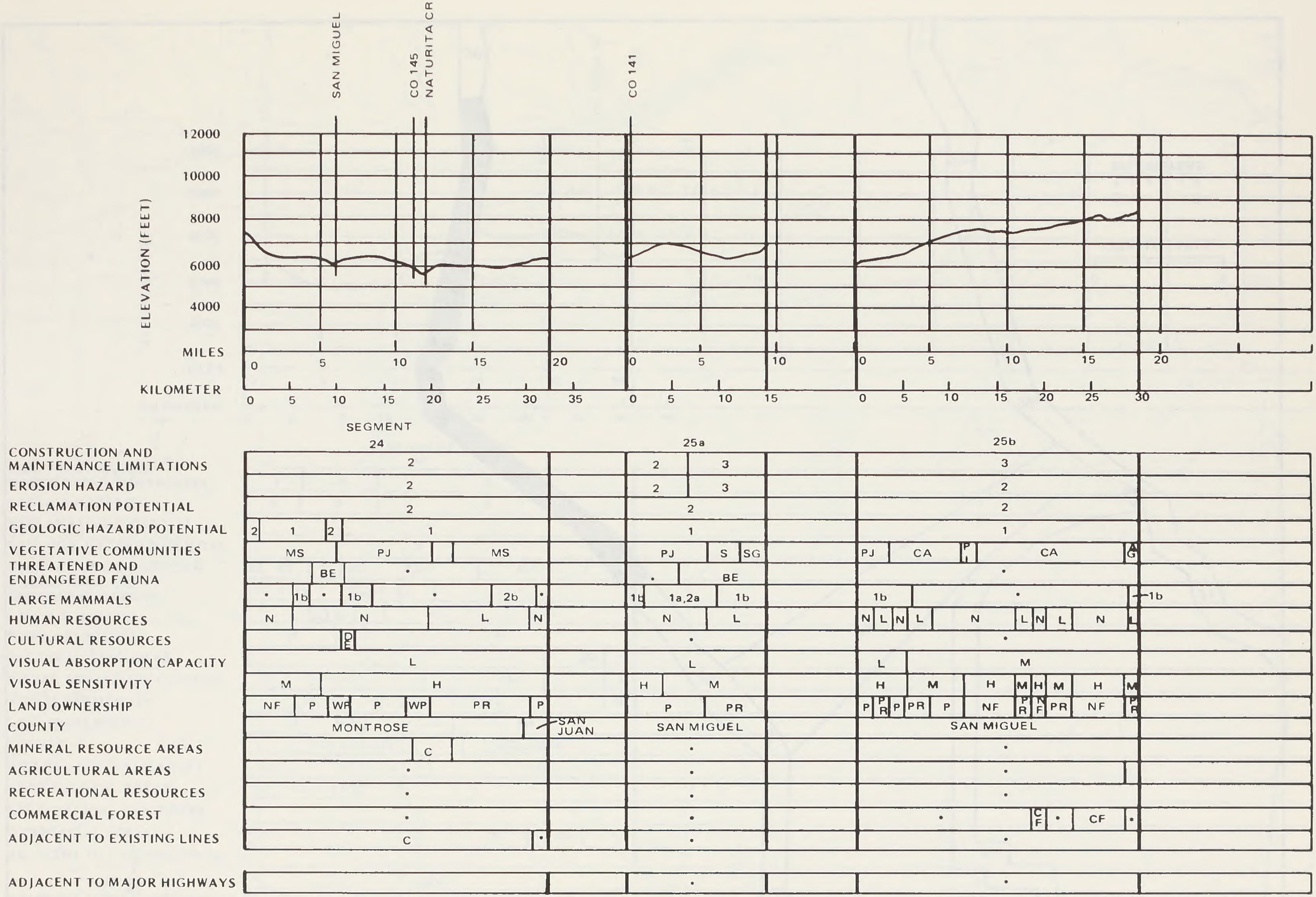
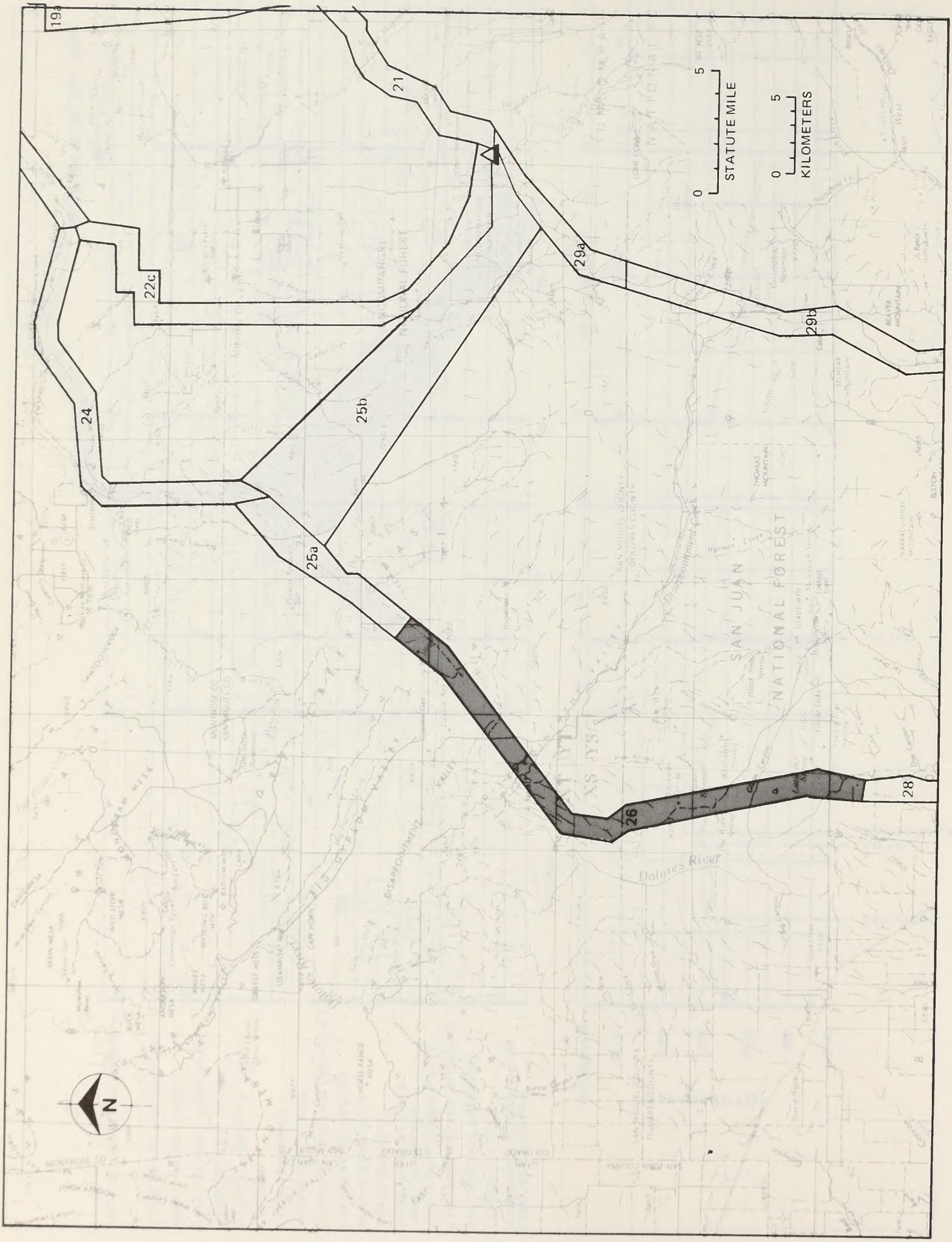


Figure 4-23
SEGMENTS 24, 25a, 25b


19a
21
22c
24
25a
25b
26
28
29a
29b
0 5
STATUTE MILE
0 5
KILOMETERS
N
UNCOMPAHGRE NATIONAL FOREST
SAN JUAN NATIONAL FOREST
Dolores River
DISAPPOINTMENT
SAN MIGUEL COUNTY
DOLORES COUNTY
THOMAS MOUNTAIN
BEAVER MOUNTAIN

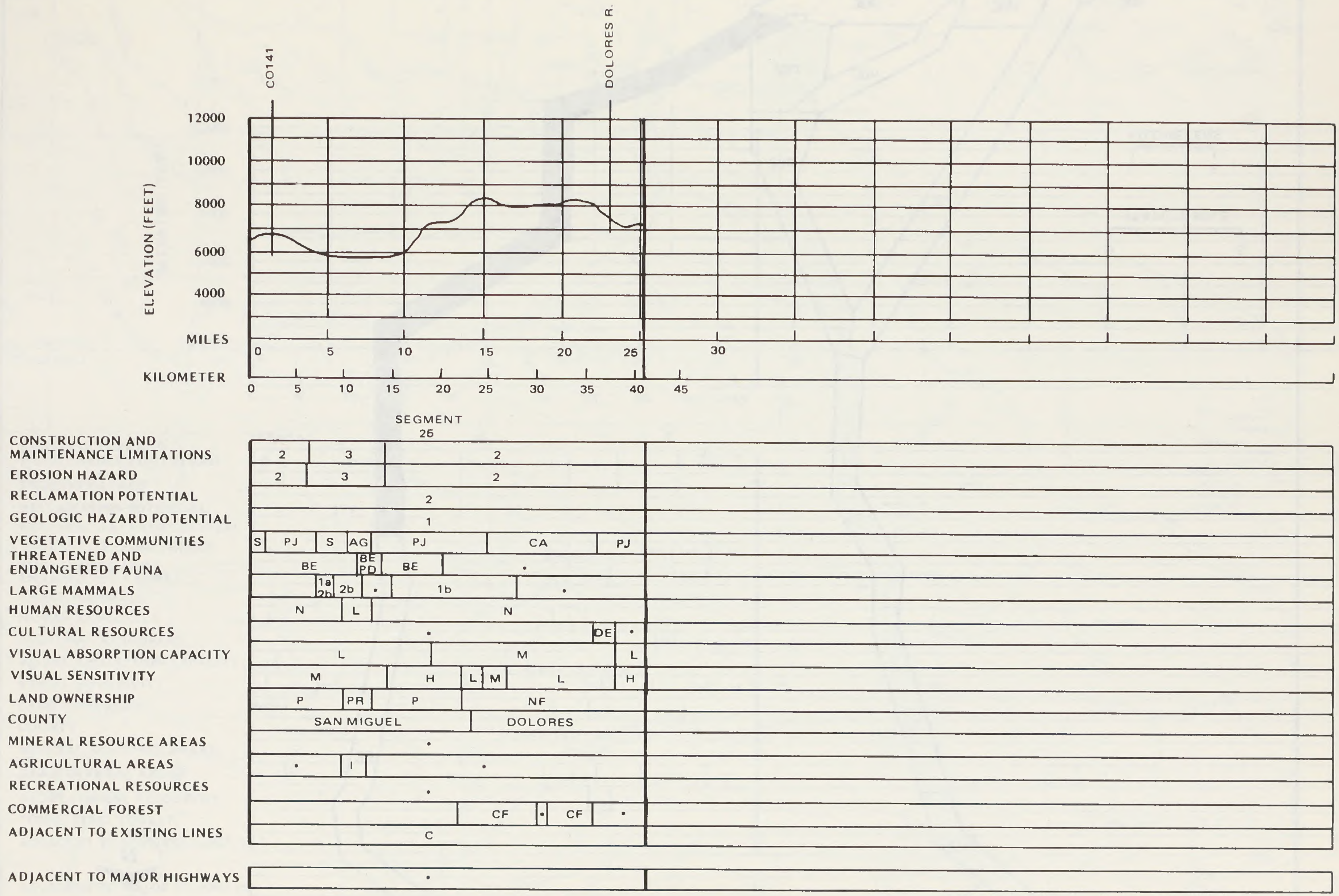
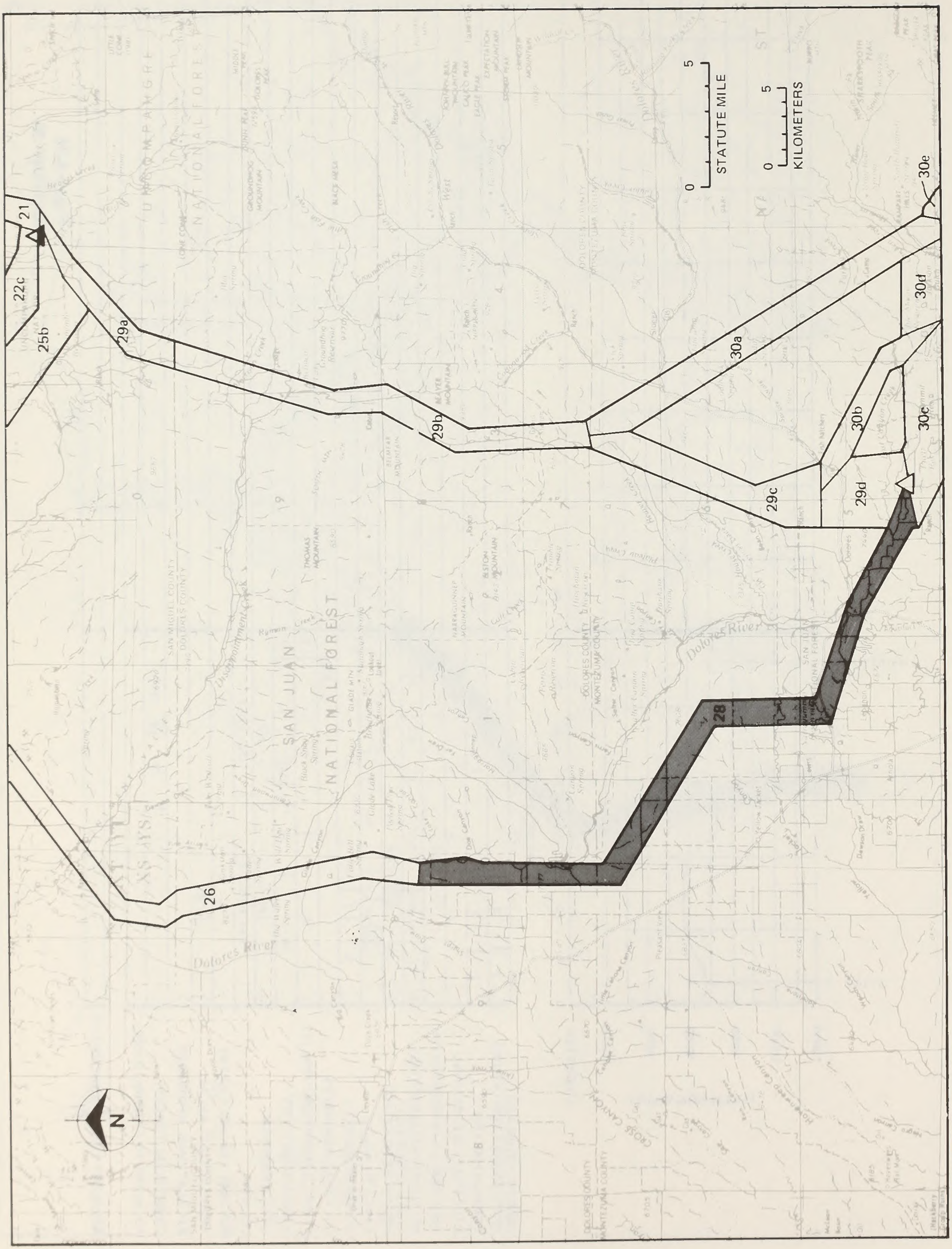


Figure 4-24
SEGMENT 26


21
22c
25b
26
28
29a
29b
29c
29d
30a
30b
30c
30d
30e
0 5
STATUTE MILE
0 5
KILOMETERS
N
SAN JUAN
NATIONAL FOREST
Dolores River

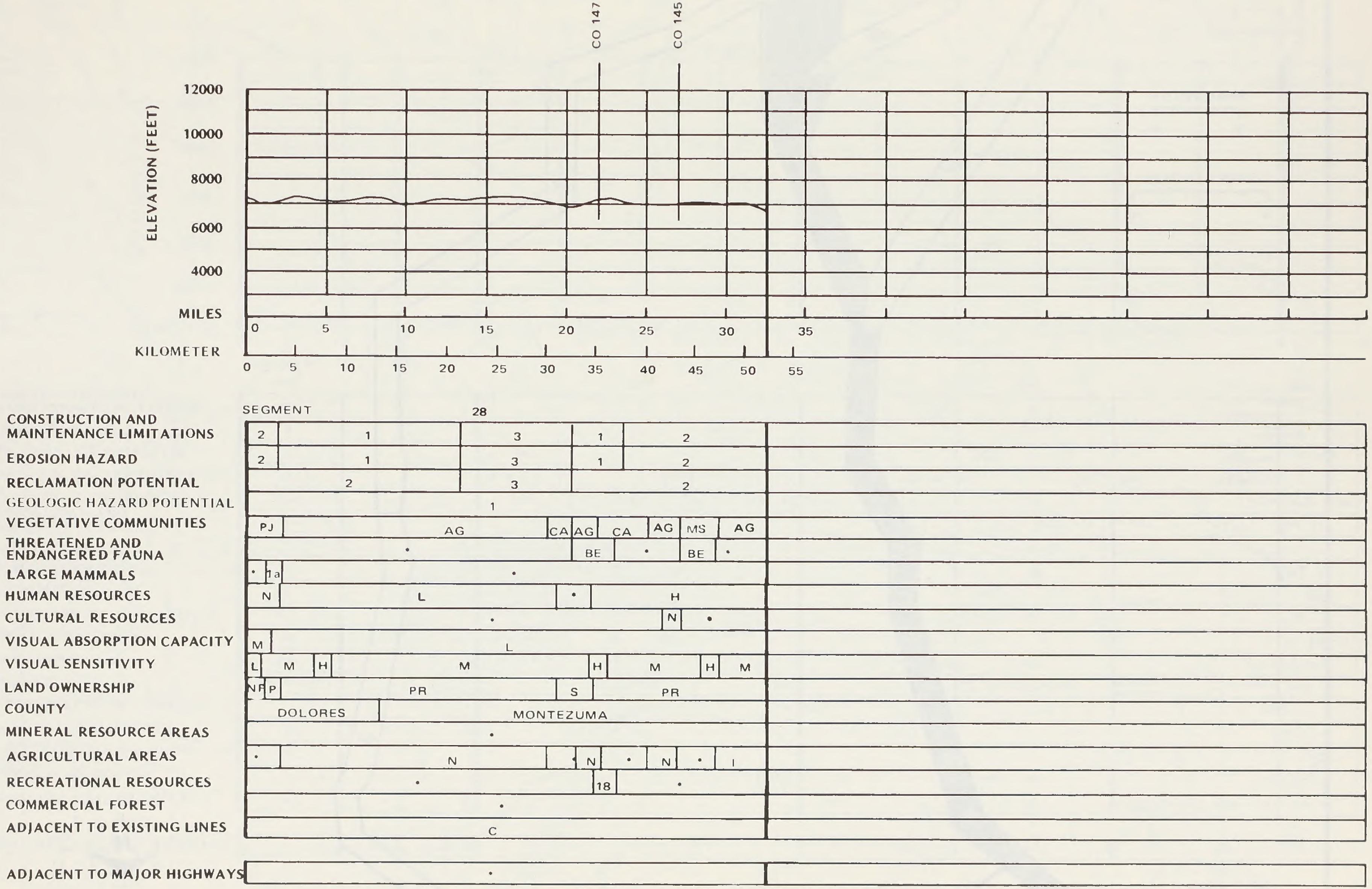
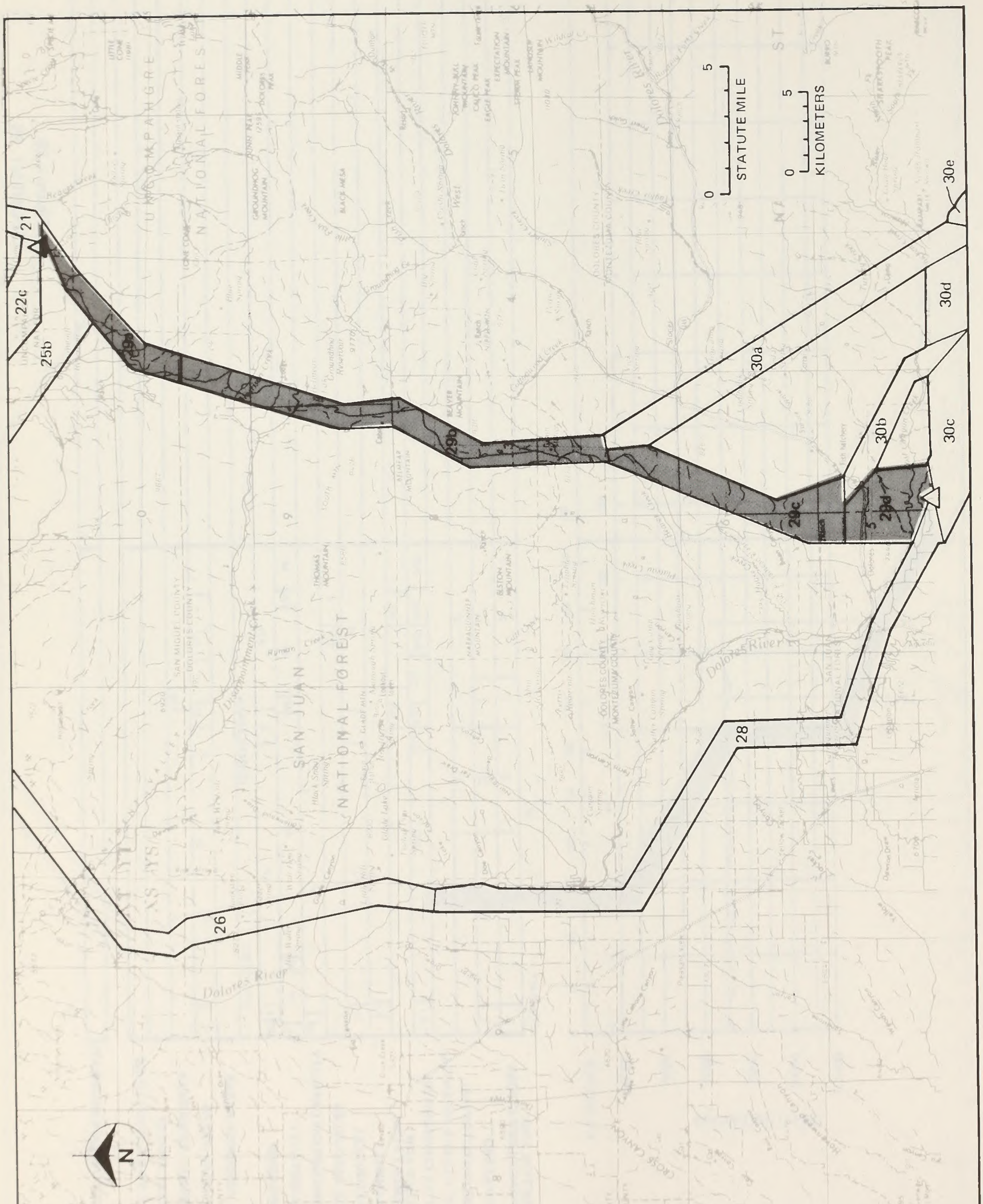


Figure 4-25
SEGMENT 28


21
22c
25b
26
28
29a
29b
29c
29d
30a
30b
30c
30d
30e
0 5
STATUTE MILE
0 5
KILOMETERS
N
SAN JUAN
NATIONAL FOREST
Dolores River
UNCOMPAHGRE
NATIONAL FOREST

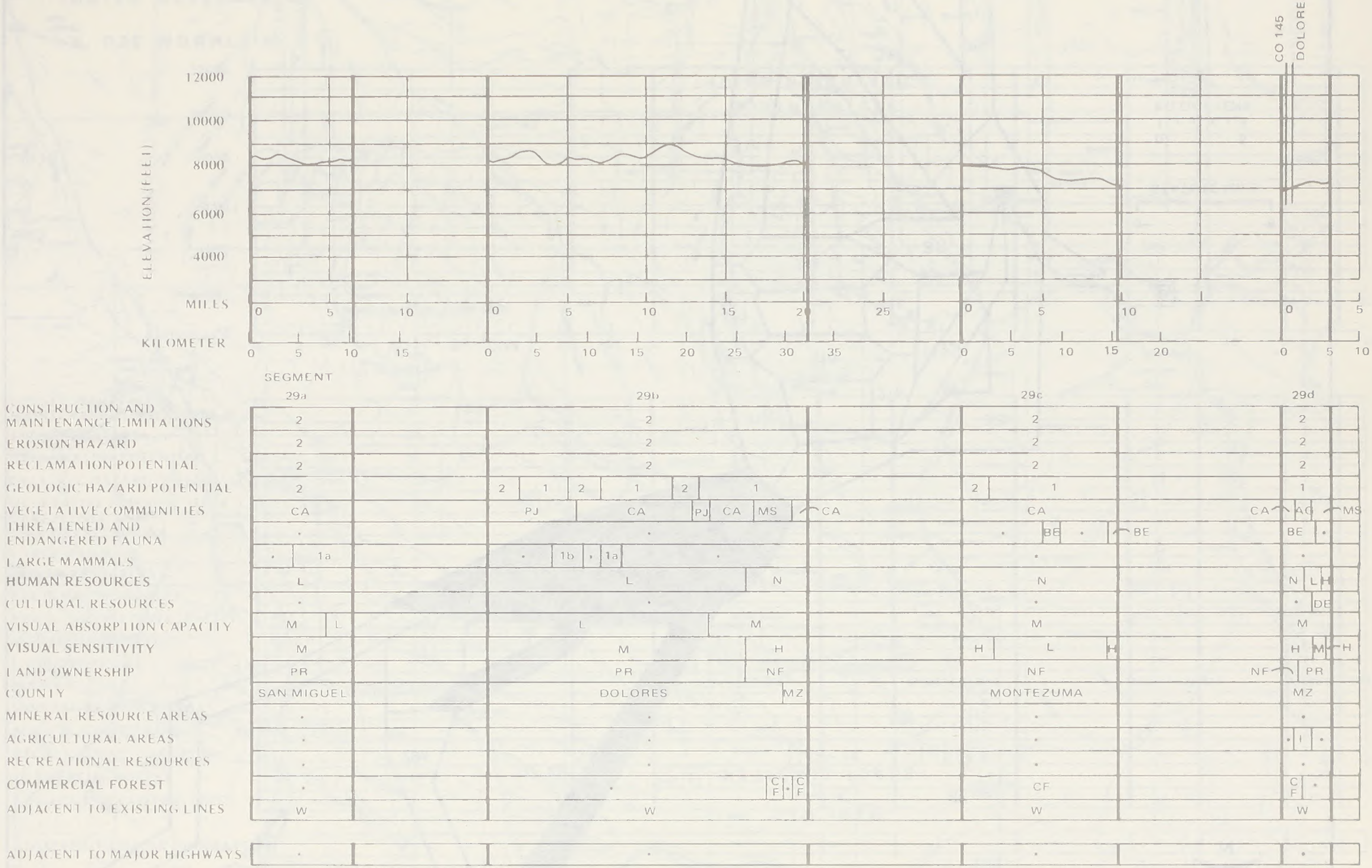
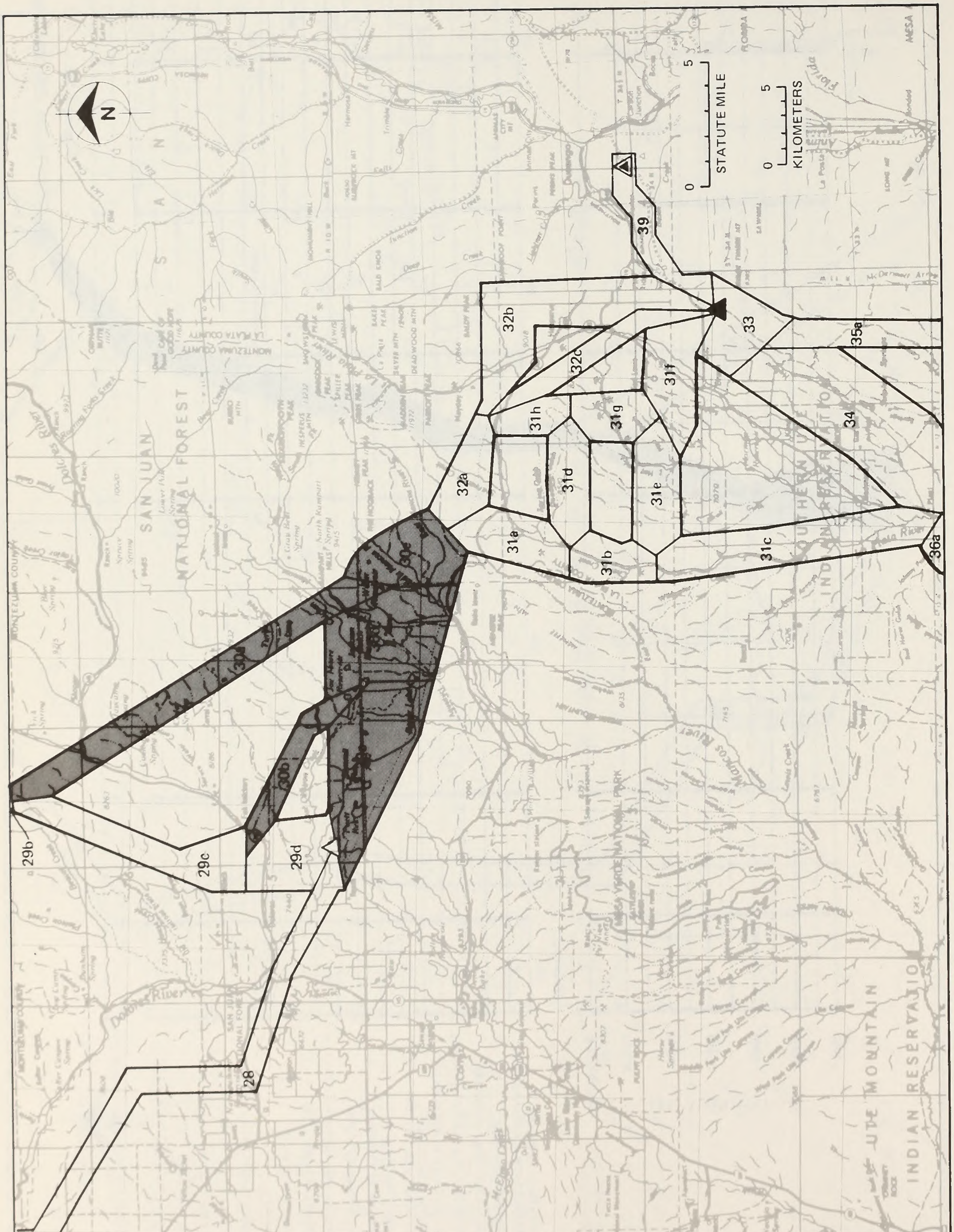


Figure 4-26
SEGMENTS 29a, 29b, 29c, 29d



N
0 5
STATUTE MILE
0 5
KILOMETERS
SAN JUAN
NATIONAL FOREST
SOUTHERN UTE INDIAN RESERVATION
UTE MOUNTAIN INDIAN RESERVATION
MESA VERDE NATIONAL PARK
Dolores River
La Plata River
28
29b
29c
29d
30a
30b
30c
30d
31a
31b
31c
31d
31e
31f
31g
31h
32a
32b
32c
33
34
35a
36a
39

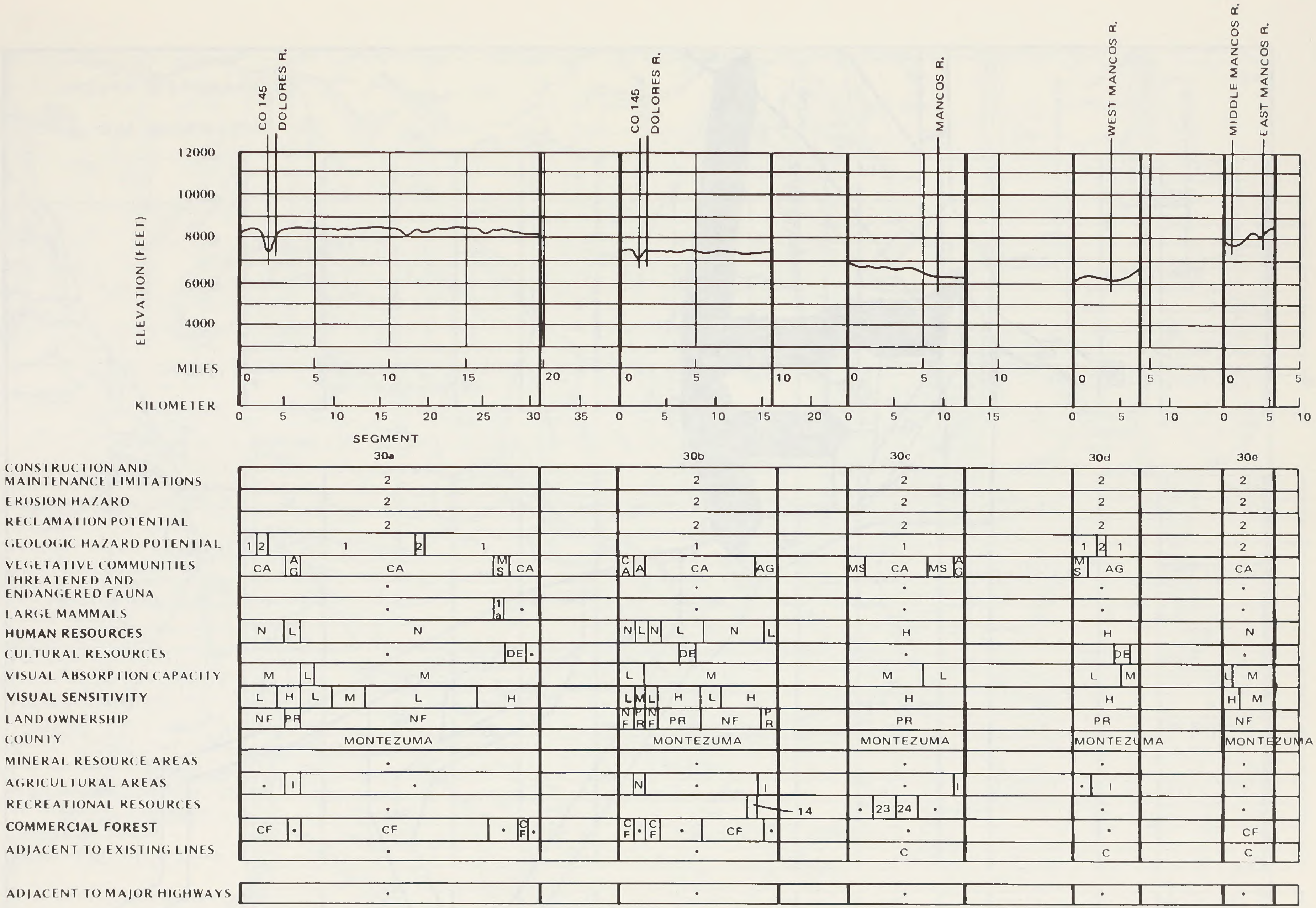
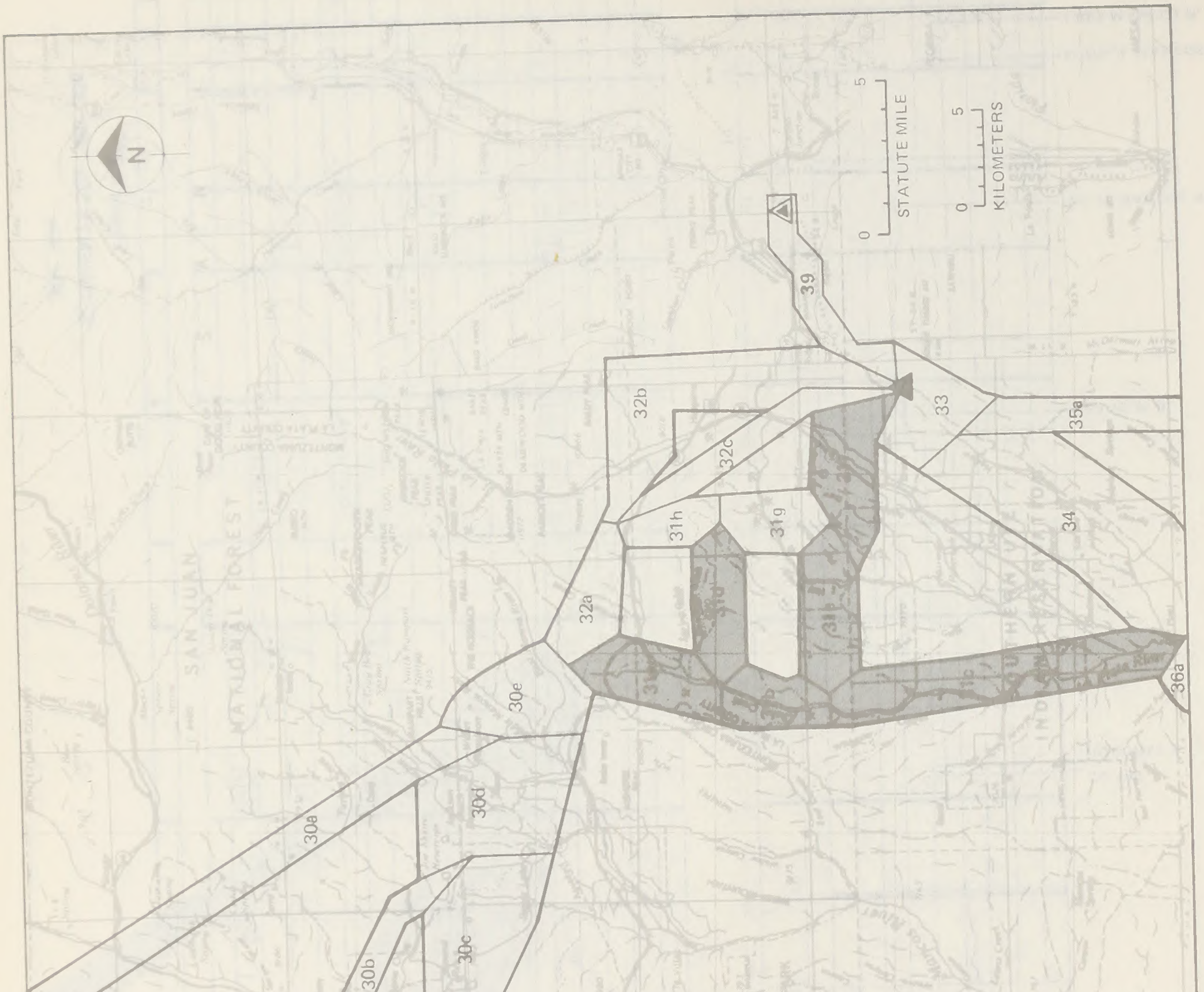


Figure 4-27

SEGMENTS 30a, 30b, 30c, 30d, 30e


N
SAN JUAN
NATIONAL FOREST
UTE MOUNTAIN
INDIAN RESERVATION
0 5
STATUTE MILE
0 5
KILOMETERS
28
29b
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29d
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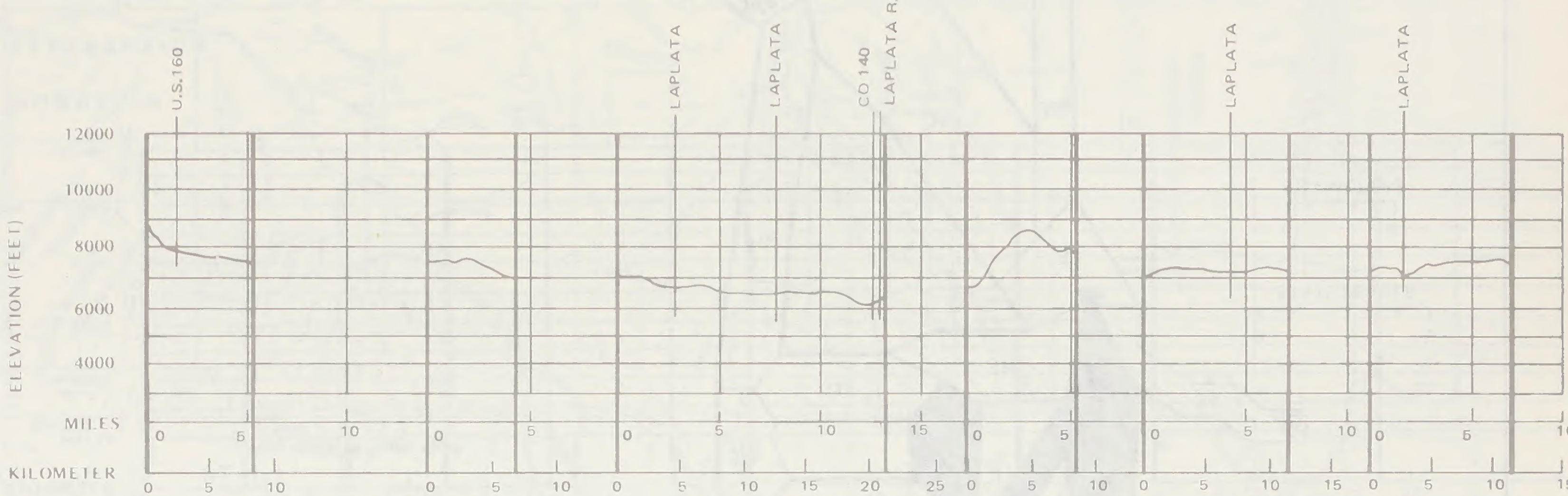
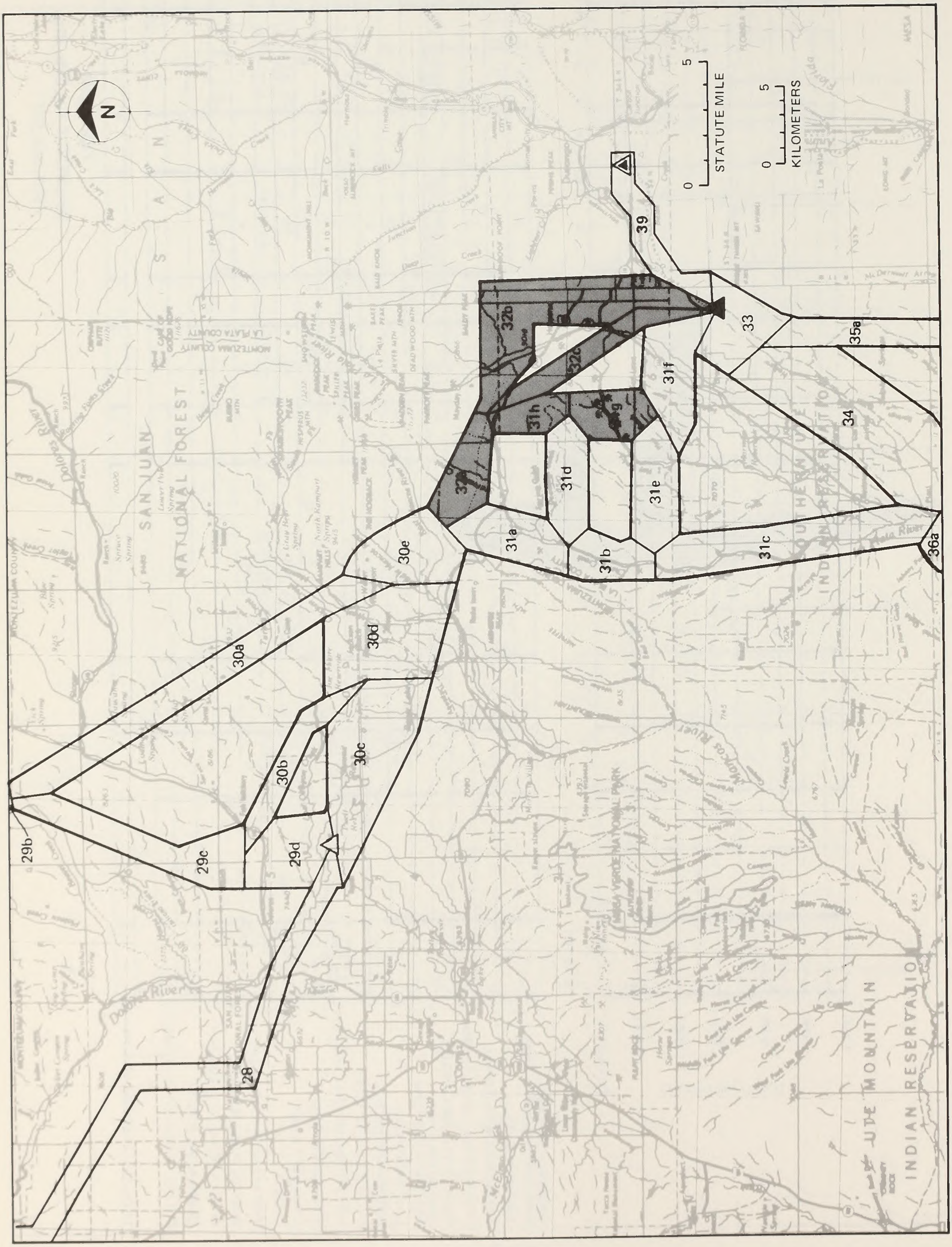
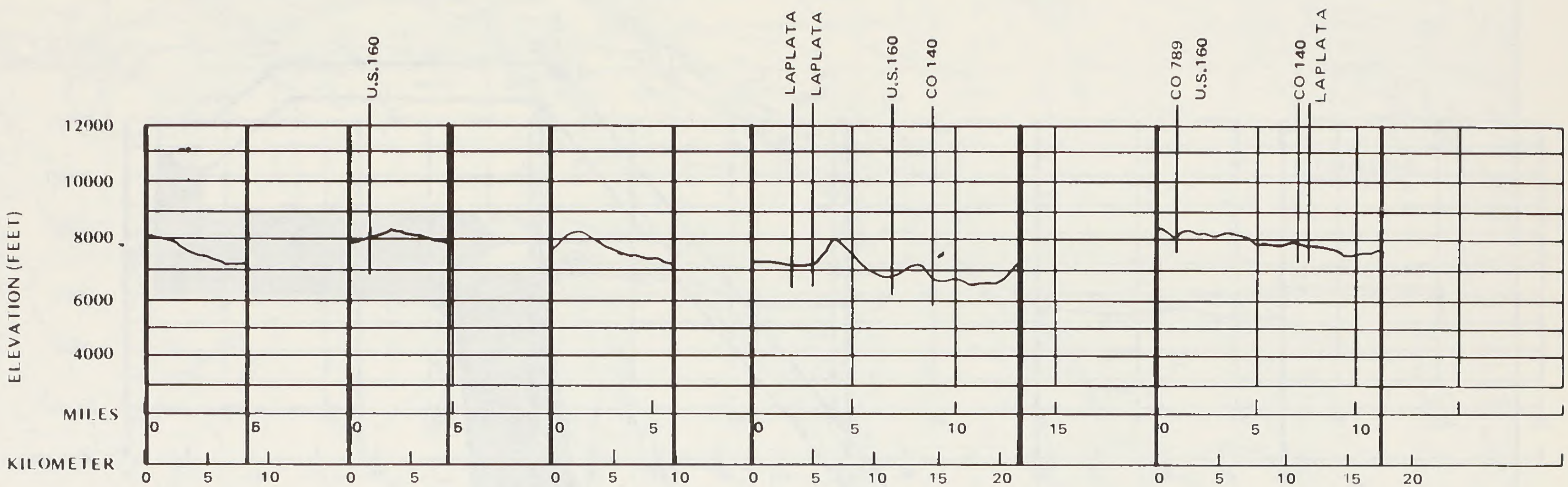
35a
36a
39



SEGMENT	31a	31b	31c	31d	31e	31f
CONSTRUCTION AND MAINTENANCE LIMITATIONS	2	2	1	1	1	1 2 1
EROSION HAZARD	2	2	1	1	1	1 2 1
RECLAMATION POTENTIAL	2	2	2	2	2	2
GEOLOGIC HAZARD POTENTIAL	1 2	1	1	2	1	1
VEGETATIVE COMMUNITIES	CA AG	AG	PJ B PJ AG PJ	MS	AG B A/G P/J AG	P/J A/G P/J C/A AG
THREATENED AND ENDANGERED FAUNA	•	•	•	•	•	•
LARGE MAMMALS	•	• 1a	1a	•	1a	1a
HUMAN RESOURCES	N L	L	L	L	L	L • L
CULTURAL RESOURCES	•	•	•	•	•	S S •
VISUAL ABSORPTION CAPACITY	M L M	M L	L	M	M L	L
VISUAL SENSITIVITY	M H M	M	M L M	M H M H M	M	M
LAND OWNERSHIP	NF PR	PR	PR PR,I	PR	PR	PR S I PR I
COUNTY	LA PLATA	LAPLATA	LA PLATA	LA PLATA	LA PLATA	LAPLATA
MINERAL RESOURCE AREAS	• C	C	• G •	C	C	C •
AGRICULTURAL AREAS	• I	I	• N •	•	I • N • I	• I • I
RECREATIONAL RESOURCES	•	•	•	•	•	•
COMMERCIAL FOREST	CF •	•	•	•	•	•
ADJACENT TO EXISTING LINES	•	•	•	•	•	• C
ADJACENT TO MAJOR HIGHWAYS	•	•	•	•	•	•

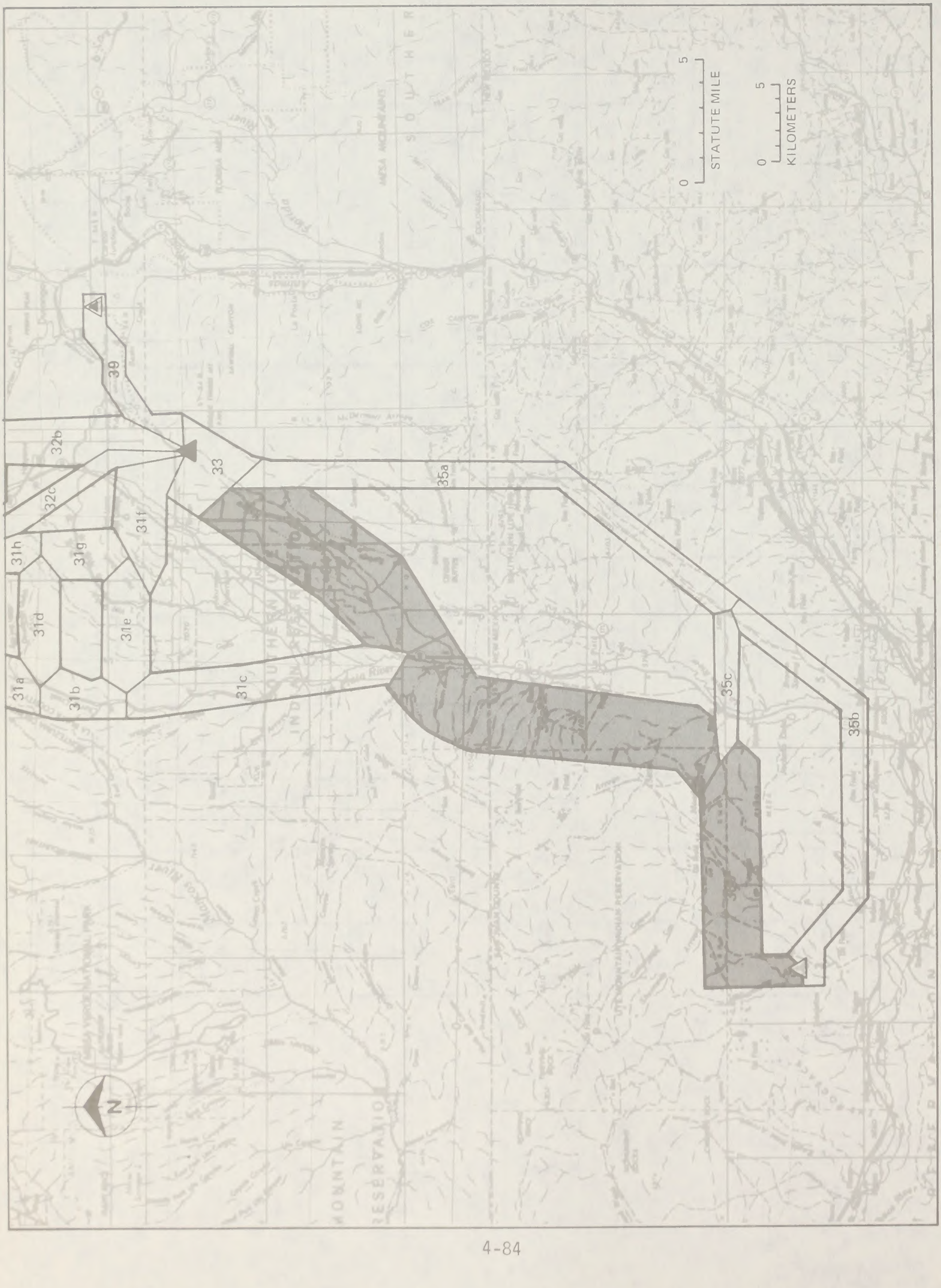
Figure 4-28
SEGMENTS 31a, 31b, 31c, 31d, 31e,,31f


N
0 5
STATUTE MILE
0 5
KILOMETERS
28
29b
29c
29d
30a
30b
30c
30d
30e
31a
31b
31c
31d
31e
31f
31h
32a
32b
32c
33
34
35a
36a
39
SAN JUAN NATIONAL FOREST
MESA VERDE NATIONAL PARK
UTE MOUNTAIN INDIAN RESERVATION
SOUTHERN UTE INDIAN RESERVATION
LA PLATA COUNTY
MONTEZUMA COUNTY
Dolores River



SEGMENT	31g	31h	32a	32b	32c
CONSTRUCTION AND MAINTENANCE LIMITATIONS	1 2	2 1	2	2 1 2	2 1 2 1
EROSION HAZARD	1 2	2 1	2	2 1 2	2 1 2 1
RECLAMATION POTENTIAL	2	2	2	2	2
GEOLOGIC HAZARD POTENTIAL	1	2 1	2	1	1
VEGETATIVE COMMUNITIES	MS PJ AG PJ	MS CA MS	CA	MS CA AG	SG AS GG MS AG SG AG
THREATENED AND ENDANGERED FAUNA	•	•	•	•	•
LARGE MAMMALS	• 1a	•	•	• 1a	• 1a
HUMAN RESOURCES	L	L	N	N H N H L	L N L
CULTURAL RESOURCES	•	•	•	• DE •	•
VISUAL ABSORPTION CAPACITY	M L	M	M H M	L	M L
VISUAL SENSITIVITY	M	H M	L	H	H M H
LAND OWNERSHIP	PR	NF PR	NF	NF PR S PR I	PR P PR I
COUNTY	LA PLATA	LAPLATA	LA PLATA	LA PLATA	LAPLATA
MINERAL RESOURCE AREAS	C	• C	•	• C	• C •
AGRICULTURAL AREAS	• I •	•	•	• I	• I • I • N I
RECREATIONAL RESOURCES	•	•	•	•	•
COMMERCIAL FOREST	•	•	CF	•	•
ADJACENT TO EXISTING LINES	•	•	• C	C • C	• C
ADJACENT TO MAJOR HIGHWAYS	•	•	•	•	•

Figure 4-29
SEGMENTS 31g, 31h, 32a, 32b, 32c


31a
31b
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35c
39
0 5
STATUTE MILE
0 5
KILOMETERS
N

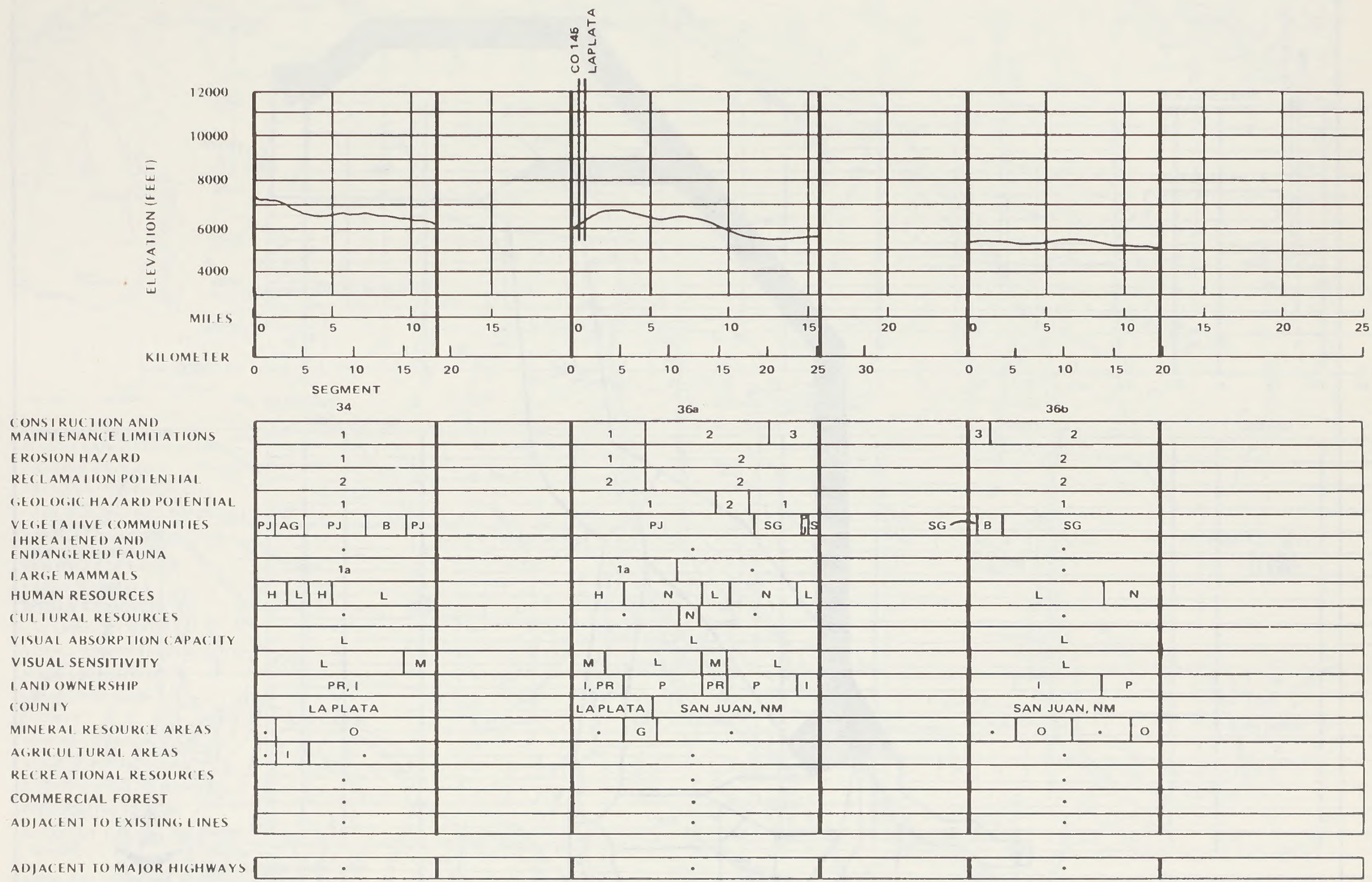
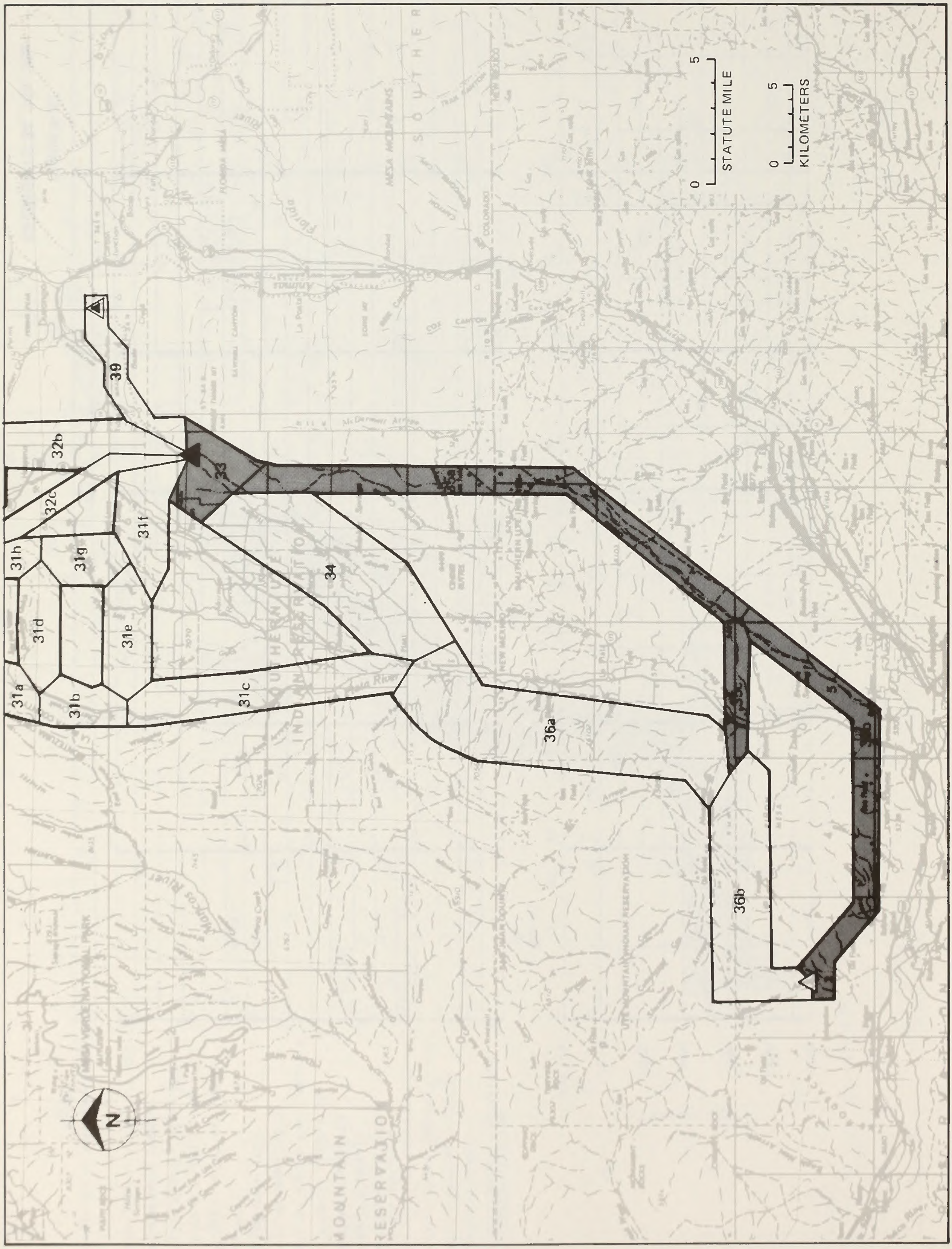


Figure 4-30
SEGMENTS 34, 36a, 36b


31a
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KILOMETERS
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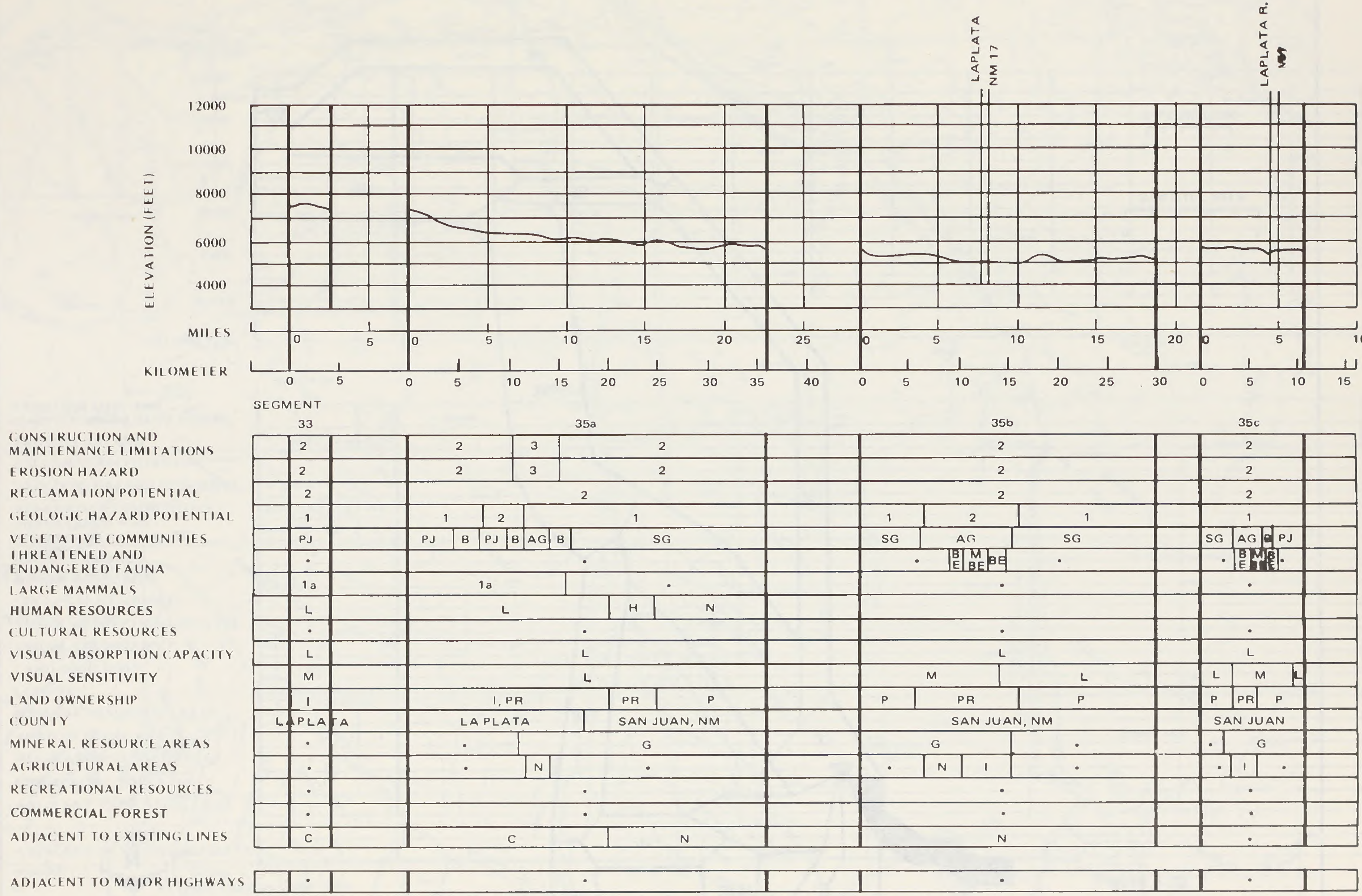
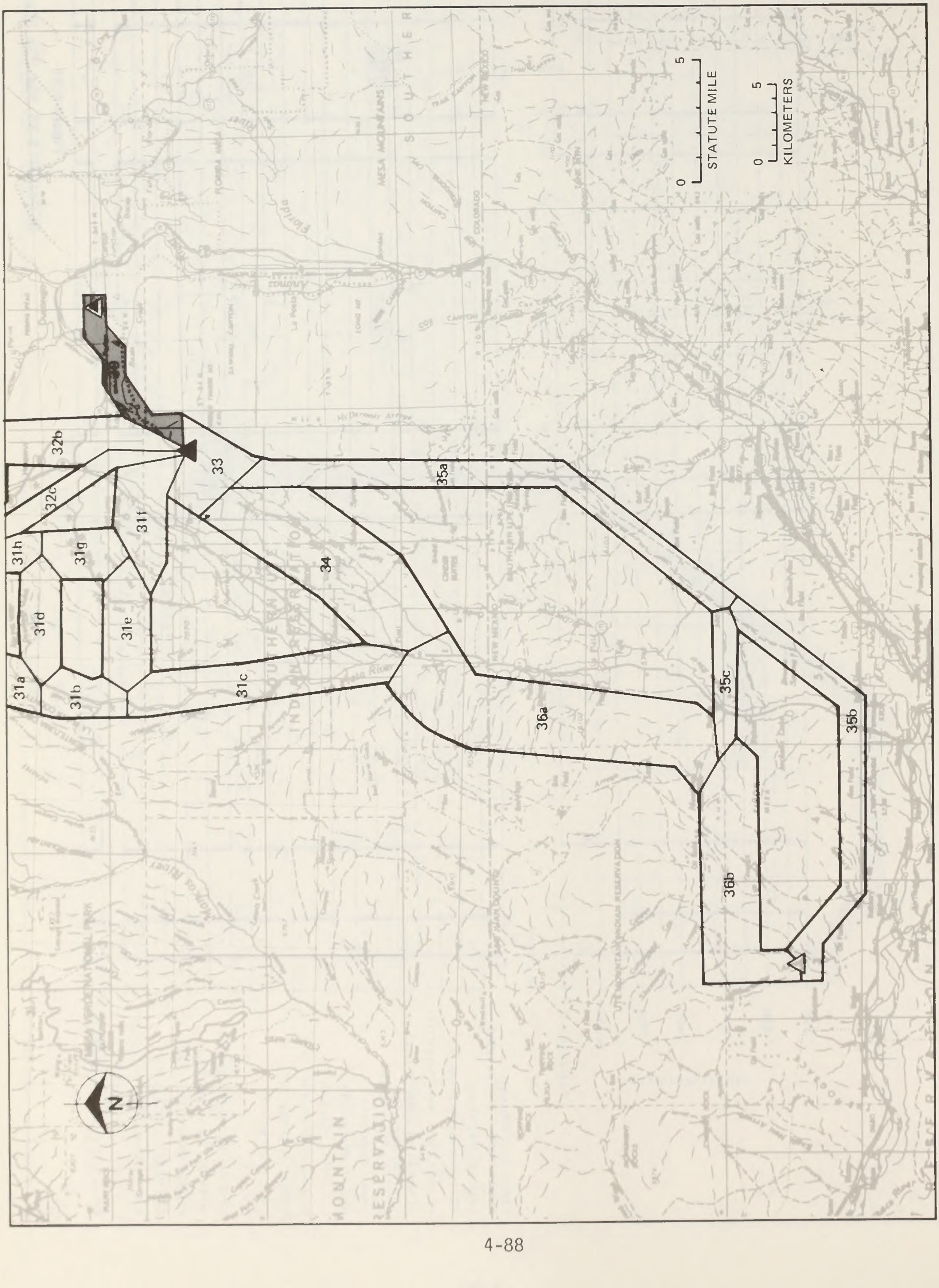


Figure 4-31
SEGMENTS 33, 35a, 35b, 35c


31a
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36b
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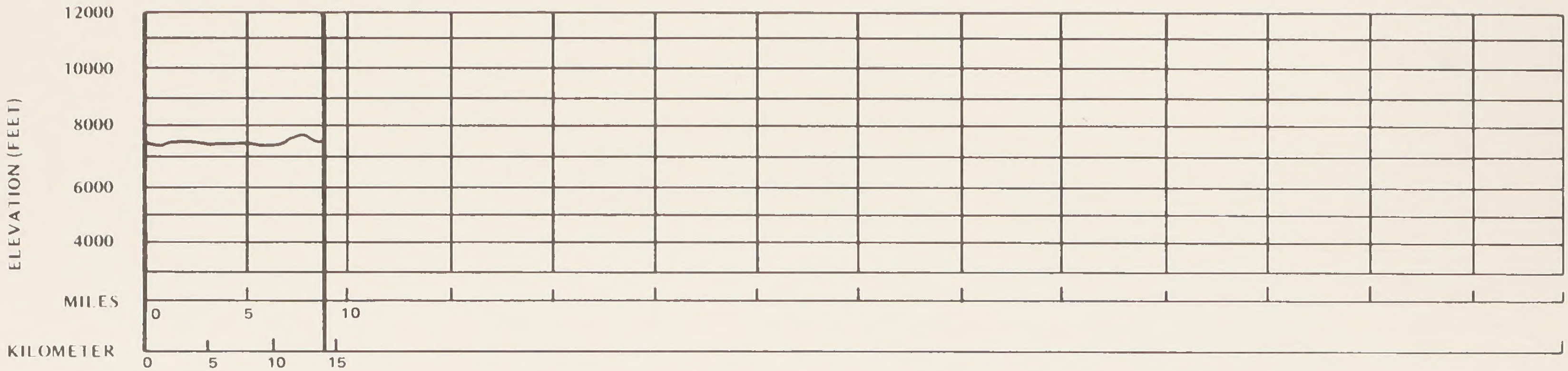
KILOMETERS



	SEGMENT 39
CONSTRUCTION AND MAINTENANCE LIMITATIONS	2 | 1 | 2
EROSION HAZARD	2 | 1 | 2
RECLAMATION POTENTIAL	2
GEOLOGIC HAZARD POTENTIAL	1
VEGETATIVE COMMUNITIES	MS | CA | AG | CA | AG
THREATENED AND ENDANGERED FAUNA	• | BE | •
LARGE MAMMALS	1a
HUMAN RESOURCES	L | H | L
CULTURAL RESOURCES	•
VISUAL ABSORPTION CAPACITY	L
VISUAL SENSITIVITY	M | H | M
LAND OWNERSHIP	I | PR
COUNTY	LaPLATA
MINERAL RESOURCE AREAS	• | C | •
AGRICULTURAL AREAS	• | I | • | I
RECREATIONAL RESOURCES	•
COMMERCIAL FOREST	•
ADJACENT TO EXISTING LINES	C
ADJACENT TO MAJOR HIGHWAYS	•

Figure 4-32
SEGMENT 39

5.0 Environmental Consequences

5.1 Geologic Hazards

5.1.1 General Transmission Line Impacts

Topography and Geology

The regional topography, geomorphology, and subsurface geology (below about 12 m or 40 feet) of the study area would not be physically disturbed by the construction of the proposed project. The local topography and surface and subsurface geology (down to a maximum depth of about 12 m) would be disturbed in small areas by the construction of substations, grading and construction of access roads, and excavation for tower foundations.

Seismicity

Because the proposed transmission system would be located in an area of low seismic risk (Zone 1 as defined by Algermissen, 1969), earthquakes should pose only a minimal threat to the system. Earth fissures and slippage are very local and, therefore, are expected to affect only a few structures, if any. Rock slides associated with earth movement could also affect local sections of the line.

5.1.2 Substation Impacts

All of the existing and proposed substations are located within stable geologic areas. Construction of the new substation or expansion of existing substations would not expose them to a high geologic risk; therefore, no problems are anticipated during and after project development.

5.1.3 Mitigation

Potentially unstable geologic hazard areas would be investigated during the soils investigation, which would be done prior to locating towers and access roads. Where possible, towers would not be located on potentially unstable slopes. Further, tower locations would be sought that present the best available foundation conditions: friable and nonindurated rock would be avoided if possible, as well as soils characterized as dispersive or susceptible to hydrocompaction. Disturbed areas would be restored to near original grade or to a grade satisfactory to the landowner or land manager. Access roads would be properly aligned and graded to conform with the natural landscape. Damage to existing access roads would be repaired. Fill material would not be disposed of in geologically unstable areas.

Active fault areas and epicenters would be avoided if possible. Towers and substation structures would be designed and

constructed in conformity with applicable engineering and building standards. Also, should it prove unavoidable to place a tower near an active fault, the tower location would be selected on the basis of its expected seismic response.

Areas where rock slides are likely to occur, such as talus slopes, would be avoided to minimize possible damage due to slides. Based on the low seismic risk and the implementation of sound geologic mitigation, any earthquake activity would have only a minimal effect on the proposed project.

5.1.4 Alternative Corridor Impact Comparison

The amount of stable and unstable areas within each transmission corridor segment has been identified based on information contained on U.S. Geologic Survey landslide deposit maps. However, the maps do not provide an indication of the relative age or activity of the unstable areas, nor have qualified geologists investigated unstable areas. Therefore, there is a strong possibility that towers and access roads can be safely located within classified unstable areas once geologic investigations are conducted. Because of that possibility, siting in potentially unstable areas is considered to have a medium impact potential and siting in stable areas a low geologic impact potential.

Rifle Substation to Grand Junction Substation

Each of the alternatives in this section crosses more stable than potentially unstable areas. Alternatives D, E, F and G traverse the most unstable area since segment 4 crosses 29 km (18 miles) of potentially unstable geologic deposits. Conversely, Alternative C traverses more stable areas than the other alternatives because of the lack of classified unstable areas in segment 3e north of the Colorado River. Alternatives A and B have slightly lower impact potentials than the preferred (Alternative H) but not enough to warrant one over the other.

Grand Junction Substation to Montrose Substation

There are no potentially unstable areas traversed in segments 5b or 12 which are common to all alternatives south of the Grand Junction Substation. Alternative C crosses the most potentially unstable area 7.5 km (4.7 miles). Alternative A does not traverse any unstable area; the preferred (Alternative B) crosses 5.1 km (3.2 miles). Geologic hazard impacts in this section would be minimal.

Montrose Substation to Norwood Substation Site

The overall total length of unstable conditions for Alternatives A (the preferred corridor), C, and D are 10.9, 15.8, and 12.4 km

(6.8, 9.9 and 7.7 miles), respectively. Alternatives B and E crosses the lowest amounts of potentially unstable deposits--6.7 and 6.4 km (4.2 and 4.0 miles) respectively.

Norwood Substation Site to Montezuma-La Plata County Line

If the construction of a 345-kv tap line to the Lost Canyon Substation were required, Alternatives A, B (the preferred) and C would share a common corridor and cross 22.2 km (13.9 miles) of potentially unstable deposits and 41.1 km (25.7 miles) of stable deposits within segments 29a, 29b, 29c, 29d. East of a Lost Canyon tap, Alternative A crosses 5.6 km (3.5 miles) of unstable area, Alternative C, 6.9 km (4.3 miles) and the preferred, 5.6 km (3.5 miles). Therefore, Alternative C has a slightly higher impact potential with the construction of a tap line.

Without the construction of a tap, the preferred corridor and Alternative C cross a total of 27.9 km (17.4 miles) and 26.4 km (16.5 miles) of unstable deposits, and 60 km (38.0 miles) and 51.5 km (32.2 miles) of stable deposits, respectively. In this case, Alternative C has a slightly lower impact potential.

Montezuma-La Plata County Line to Long Hollow Substation

Alternative B traverses the greatest area of potentially unstable deposits, 12.8 km (8.0 miles), versus 9.6 km (6.0 miles) for Alternatives D and the preferred (Alternative C), and 10.4 km (6.5 miles) for Alternative E. Alternative A crosses only 4.5 km (2.8 miles) of potential unstable geologic deposits but is longer than the preferred and, therefore, has a greater potential to impact surficial geologic features.

Long Hollow Substation to San Juan Generating Station

Greater geologic hazards occur within segment 35b (part of Alternative A) which crosses 10.9 km (6.8 miles) of potentially unstable deposits. The other alternatives and the preferred (Alternative C) traverse from 3.2 to 4.0 km (2.0 to 2.5 miles) of unstable areas versus 13.3 km (8.3 miles) for Alternative A. Alternative D is the longest alternative. Alternative A has the greatest geologic impact potential.

Long Hollow to Durango 115-kv Corridor

This corridor traverses deposits classified as stable.

In summary, construction-caused surface disturbances increase the likelihood of potential geologic hazards. The preferred corridor traverses roughly 359 km (216 miles) of areas considered stable and 86 km (54 miles) of areas considered potentially unstable.

5.1.5 Secondary Impacts

There are no known secondary impacts.

5.1.6 Cumulative Impacts

There are no known cumulative impacts.

5.1.7 Adverse Impacts Which Cannot Be Avoided

There are no known adverse impacts which cannot be avoided.

5.2 Impacts on Soils

5.2.1 General Transmission Line Impacts

The discussion of impacts on the soils crossed by the proposed project is based on information described in general soil surveys available for the study area. Table 4-1 summarizes the soil rating system for the soils encountered within the study area. Specific erosion hazards, reclamation potential, and construction and operation limitations for the soils crossed by the corridor segments have been identified in Figures 4-12 through 4-32. The majority of the segments are generally rated as having moderate to low construction limitations, moderate to low erosion hazard, and fair to good reclamation potential. Eleven segments (12, 15d, 15e, 17b, 19a, 25a, 25b, 26, 28, 35a and 36a) are rated as having major construction and maintenance limitations, and eleven segments (3d, 3e, 3f, 3j, 3h, 3i, 4, 5a, 5b, 15e, and 28) are rated as having poor reclamation potential.

Overall, soil impacts along the transmission line are expected to be minimal due to the localized nature of the impact. However, soil disturbance would occur during the construction of access roads, creating an erosion potential. More erosion impact would occur on disturbed soils with a high erosion potential and a poor reclamation potential than on those rated moderate/low and fair/good.

In mountainous terrain, soil erosion and loss could be accelerated by construction of access roads if not properly maintained. In segments that parallel existing transmission lines, the potential for soil erosion would be less since existing access roads may be utilized.

5.2.2 Substation Impacts

Upper soils within the 3-5 ha (8-12 acre) substation construction areas would be disturbed during vegetation removal and grading. Crushed rock and soil sterilents would be used to prevent regrowth of vegetation and to control erosion.

The new Long Hollow substation site is rated as moderate in erosion hazard and fair in reclamation potential.' Soils at this

site are clayey. The soils in the vicinity of the existing Grand Junction, Durango, and Montrose substations are generally loamy. The Durango Substation site has low erosion potential and fair reclamation potential. The area around the Montrose Substation has low erosion potential and fair reclamation potential. Slopes vary from level at the Montrose Substation to gently sloping at the Grand Junction Substation to steep in the vicinity of the Durango Substation.

Given the low-to-moderate erosion potential and the generally good-to-fair reclamation potential of the substation areas to be disturbed, no significant soil erosion impacts are expected.

5.2.3 Mitigation

Soils disturbed at the sites would be protected from erosion by employing standard construction procedures (i.e., proper grading, compacting, thatching, riprap). The transmission line would be constructed in a manner that would minimize vegetation removal and subsequent soil erosion. Clearing and grading of construction storage and staging areas would be limited. Construction specifications would be developed requiring the construction contractor to minimize clearing and grading. Also, there would be close supervision of construction activities to ensure that soil disturbance and damage to vegetation would be kept to a minimum. The disturbance of steeply sloping areas and highly erodible soils, identified by soil investigations during the design phase, would be avoided as much as possible. Affected land management agencies and private landowners would be consulted on revegetation, restoration and clean-up measures prior to their implementation. These measures would promote return of the affected areas to a non-erodible condition.

5.2.4 Alternative Corridor Impact Comparison

Information on the soil erosion hazards, reclamation potential, and construction and operations limitations of the alternative corridors has been derived from the information presented in Figure 4-4 and Table 4-1. Specific assumptions used in the development of the comparisons are described in Appendix B.

Rifle Substation to Grand Junction Substation

None of the soils crossed by the preferred corridor or alternative corridors have high erosion hazards nor major construction limitations. However, there are portions that have poor reclamation potential.

Segment 5a 13.6 km (8.5 miles) is common to all corridors between Rifle and Grand Junction. The erosion hazard in this segment is

low for 9.3 km (5.2 miles) and moderate for 5.3 km (3.3 miles). Reclamation potential is poor for 4.0 km (2.5 miles), fair for 5.1 km (3.2 miles) and good for 4.5 km (2.8 miles). There are no major construction limitations in this segment and significant impacts to the soils are not expected with the employment of the mitigation measures specified above.

The participants' preferred corridor (Alternative H) east of segment 5a traverses 13.3 km (8.3 miles) of soils with a low erosion hazard and 67.8 km (42.4 miles) of soil with moderate erosion hazards. All of the alternative corridors have longer sections of soils with moderate erosion hazards than the preferred alternative.

Reclamation potential along Alternative H east of segment 5a is poor for 5.4 km (3.4 miles). Otherwise, reclamation potential is fair for 40.0 km (25.0 miles) and good for 31.7 km (19.8 miles). Alternative B has the poorest reclamation potential. It traverses 50 km (31.3 miles) of Ustollic Natrargids and Haplargids, soils with poor reclamation potential in segments 3d, 3f, and 3j. Alternative A crosses these soils for 30.4 km (19.0 miles) east of segment 5a. Alternatives D, E, F and G typically traverse soils with fair reclamation potential. None of the alternatives presents serious construction limitations. Alternative B has the poorest reclamation potential, but would parallel the existing PSC 230-kv transmission line. Neither serious construction limitations nor erosion hazards were encountered during the construction of the PSC line.

Grand Junction Substation to Montrose Substation

Segments 5b and 12 are common to all alternatives between Grand Junction and Montrose. Segment 5b traverses Typic Calciorthids and Ustic Torriorthents, soils with low erosion hazards and slight construction and operation limitations, but poor reclamation potential. Segment 12 crosses 23.2 km (14.5 miles) of Ustollic Haplargids soils with moderate erosion hazards and construction limitations, and fair reclamation potential: however, 4.8 km (3 miles) of Typic Torriorthents soils with major construction limitations are traversed.

Alternatives A, C, and the preferred (Alternative B), south of Segment 12, cross soils with a medium impact potential, but for varying distances: Preferred (B), 13.7 km (8.6 miles): A, 11.7 km (7.3 miles); and C, 36.8 km (23 miles). Therefore, Alternative C has the greatest potential to impact soils. With the employment of the appropriate mitigation measures, significant impacts to soils in this section are not expected.

Montrose Substation to Norwood Substation Site

Potential erosion hazards are similar for each alternative. Impact differences are, therefore, apparent from differences in reclamation potential and construction limitations. The preferred alternative in segment 19a 34.4 km, (21.5 miles) traverses soils with minimum impact potential, except for 5.6 km (3.5 miles) which cross soils with major construction limitations. Alternative E has a high potential to impact soils since 13.1 km (8.2 miles) with poor reclamation potential and 5.9 km (3.7 miles) with major construction limitations are traversed. Segment 15d within Alternative B has major construction limitations for 8.0 km (5.0 miles). Alternatives C and D traverse soils with fair reclamation potential and moderate construction limitations, except for 5.6 km (3.5 miles) in segment 17b with major construction limitations. Thus, alternatives C and D have greater potential to impact soils in this section due to their longer lengths. Alternative E, although similar in length to the preferred (Alternative A), has a higher impact potential due to the presence of soils having poor reclamation potential. Foundation designs would incorporate the results of soil investigations, which would specifically identify high impact areas.

Norwood Substation Site to Montezuma-La Plata County Line

From Norwood to the southern border of the San Juan National Forest, all alternatives share a common corridor for 58.4 km (36.5 miles), including segments 29a, 29b, and 29c. Also, a 4.8 km (3.0 mile) corridor is shared in segment 30e near the Montezuma-La Plata county line. The impact potential would be moderate for these common segments due to moderate erosion hazards and fair reclamation potential.

The preferred (Alternative B) and Alternatives A and C also would have moderate impacts on soils elsewhere in this section. If a Lost Canyon 345-kv tap line were constructed, Alternative C would have the greatest impact potential. However, without the construction of the tap, Alternative C would have the lowest impact potential.

Montezuma-La Plata County Line to Long Hollow Substation

All the soils traversed by the corridors in this section have fair reclamation potential. Alternative C (preferred) and Alternatives D and E share segment 32a which is 10.1 km (6.3 miles) long. Moderate soil impacts could occur in this segment. The preferred corridor occupies one other segment, 32c 14.9 km (9.3 miles), with low and moderate soil impacts. Alternative D traverses less soil with a low erosion hazard, and, therefore, receives a higher potential impact rating than the preferred.

Alternatives A, B and E cross more soils with a lower erosion hazard than the preferred, 19.8 km (12.4 miles), 17.9 km (11.2 miles), and 12.5 km (7.8 miles), respectively. However, since the preferred Alternative C is at least 4.8 km (3 miles) shorter than Alternative A, B, or E, the overall potential for soil impact potential along the preferred corridor is less.

Long Hollow Substation to San Juan Generating Station

Alternatives C, D and the preferred alternative (Alternative B) share segment 36b for 19.2 km (12.0 miles). Erosion hazard is moderate and reclamation potential fair, except for 2.4 km (1.5 miles) with major construction limitations. Corridor segment 33 is common to the preferred corridor and Alternatives A and C. Potential for soil impacts would be low to moderate through this segment.

Erosion impacts would be high and construction limitations major for 4.5 km (2.8 miles) along Alternative A and the preferred corridor (Alternative B) in segment 35a at the McDermott Arroyo crossing. Otherwise, moderate soil impacts would occur in segment 35a and the other segments traversed by Alternatives A and B.

Alternatives C and D north of segment 36b cross soils with a low impact potential and, therefore, have a lower impact potential than the preferred corridor. Specifically, Alternatives C and D traverse 25.8 and 47.5 km (16.1 and 29.7 miles), respectively, of soils with a lower impact potential than the preferred corridor. None of the alternatives traverse significant amounts of soils with high erosion hazards or major construction limitations. However, much of the area is subject to windblown soil effects which would be considered during design.

Long Hollow to Durango 115-kv Corridor

The proposed corridor for the 115-kv line from Long Hollow to Durango has soils with moderate and low erosion hazards and a fair reclamation potential.

5.2.5 Secondary Impacts

Secondary impacts include the effects on streams that may receive the increased sediment yield from disturbed area runoff, and the impacts on vegetation from airborne soil particles. However, it is unlikely that sediment yield would have more than a very local impact. Unless a disturbed area is immediately adjacent to, or has a direct access to, a well-defined stream channel, very little sediment is likely to reach the stream. Also, unless the stream flows continuously at a rate that can carry an appreciable

amount of sediment, much or all of the load would be deposited in the channel to await another flow event to carry it further downstream. The deposited sediment could have an adverse effect on the aquatic community of the receiving stream by burying spawning or feeding areas and suffocating benthic organisms (WPRS 1976). However, the mitigating measures described above in section 5.2.3 would reduce the probability of serious impact. Additionally, the transmission line would be sited to avoid placement of structures near streams as much as practical.

Wind-borne soil particles could accumulate on low-growing vegetation and restrict the amount of incident light reaching the leaf surfaces, as well as clog pores on the surface of the leaves, restricting gas exchange. Both conditions would be temporary and of a very minor nature along the ROW.

5.2.6 Cumulative Impacts

The Rifle-San Juan Project would disturb about 22 ha (54 acres) for structures and substations, and an additional 0.8 ha (2 acres) for each mile of transmission line for access roads. Only where these structures, substations and some access roads are located would a permanent disturbance occur. This impact of the Rifle-San Juan Project on soil surface disturbance in the region would be relatively minor, but does contribute to the overall cumulative impact in western Colorado and northwestern New Mexico.

5.2.7 Adverse Impacts Which Cannot be Avoided

There are no significant adverse impacts to soils which would result from the proposed project if the proposed mitigation measures are employed.

5.3 Impacts on Water Resources

5.3.1 General Transmission Line Impacts

Several rivers and numerous permanent and intermittent streams would be crossed by the proposed transmission line. Many of the small water courses may require fording during the construction of the line. Major rivers which may be crossed include the upper Colorado River; other important perennial rivers include the Gunnison, San Miguel, Dolores, Mancos and La Plata. Major river and stream crossings for each corridor segment are shown in the segment profiles in Section 4.12.

The proposed transmission line, suspended from towers located an average of 365 m (1,200 feet) apart, would have a negligible effect on water systems once it is in place. Construction or maintenance of the line, however, can affect the stream channel

and reduce stream quality if the stream must be crossed by equipment. Water quality may be reduced by increased turbidity from sediment-laden runoff (i.e., erosion), which can be expected to occur if substantial vegetation is removed from the stream bank to construct access roads or to provide clearance for powerline sag. Also, chemical pollution can result from the runoff of construction wastes such as spilled or discarded oils (Holberger et al. 1975). The construction of access roads to stream crossings can also result in increased human access to areas along the stream banks.

The construction of the proposed transmission line and substations could theoretically affect groundwater. During construction, sediment-laden runoff can plug the pore spaces in the soils of an aquifer recharge area. This would inhibit the flow of water into the groundwater supply and subsequently lower the water table in that area (Holberger et al. 1975). As a practical matter, however, the construction of the proposed transmission system would involve the excavation or grading of small areas. This reduces the probability that a groundwater recharge area could be significantly affected by the proposed project. Furthermore, the study area, except for a few isolated areas, has limited groundwater resources. The groundwater which does occur is often located at moderate depth and is not necessarily recharged by surface infiltration. It could be expected that the proposed project would have at most a minimal and indirect impact on the groundwater supplies occurring along the ROW.

The number of crossings of both perennial and intermittent streams were totalled for each alternative corridor and are presented in Section 3.7. The impacts which would result from the crossing of intermittent streams would, in most cases, be moderate because they are usually small enough to be easily spanned by the line. Major river crossings, however, would have a high impact potential.

5.3.2 Substation Impacts

In general, the construction, operation, and maintenace of substations would not have significant adverse impacts on the water resources of an area. New substation areas would occupy an additional 12 ha (30 acres) potentially inhibiting groundwater recharge. There is a potential for contamination of water resources from the improper storage and/or use of herbicides or other toxic materials in and around substations. The proposed substation construction and modifications are not expected to require the alteration of or cause pollution of existing surface or underground water resources.

5.3.3 Mitigation

Damage to streams or rivers caused by transmission line construction would be avoided by implementing the following practices:

- Construction of access roads near stream or river banks would be limited, where practicable.
- Revegetation would be done and sediment control structures would be used to control erosion where necessary in accordance with FS guides for controlling sediment (USDA, FS).
- Stream banks would not be disturbed unnecessarily so as to prevent caving or sloughing.
- Riparian vegetation would not be removed except for tall trees that conflict with transmission line operation. Use of heavy equipment to clear vegetation would not occur near bodies of water.
- Fill material would not be placed in streams or adjacent areas where excessive siltation may enter a stream as runoff.
- Streams would be crossed at existing crossings or with temporary bridges where practicable. Culverts would be used where necessary.
- Tower structures would be sited so that, to the extent practicable, they can be constructed and maintained without altering the stream or introducing sediments or contaminants into the water.
- Construction of access roads and river crossings would be in accordance with the requirements of the U.S. Army Corps of Engineers' Nationwide General Permit for Utility Line Crossings and as specified by the applicable permits and grants of rights-of-way issued by other agencies.
- Herbicides would not be used on the banks of streams or where runoff would wash the herbicides directly into a stream. The use of herbicides in substations would be done in accordance with the label directions as required by the Federal Insecticide, Fungicide, and Rodenticide Act of 1972.
- Post-construction removal of debris would be performed in a manner to avoid adding contaminants to the water.
- Herbicides, oil, and other chemicals would not be stored or disposed of in such a way as to allow drainage into surface or underground waterways.

The impact to groundwater resources by the proposed project has been determined as being negligible. Shallow aquifers would be avoided.

5.3.4 Alternative Corridor Impact Comparison

Rifle Substation to Grand Junction Substation

The number of perennial streams crossed by the alternative corridors ranges from 4 to 21, while the number of intermittent streams crossed ranges from 30 to 47.

Segment 3e in alternative C is the only segment in this section which crosses a major river. It crosses the Colorado River twice.

The preferred alternative, H, would not cross any major river or stream, but would cross seven minor perennial streams and 42 intermittent streams. Only corridors A and B cross fewer perennial streams. Alternatives D, E, F, and G cross 19 to 21 perennial streams, and they each also cross 43 intermittent streams.

Grand Junction Substation to Montrose Substation

All three of the alternatives cross the Gunnison River in segment 12. Alternative B, the preferred, crosses the Gunnison River, 5 perennial streams and 35 intermittent streams. Alternatives A and C cross the Gunnison River, 30 intermittent streams each, and 4 and 5 perennial streams, respectively.

Montrose Substation to Norwood Substation Site

All five alternatives cross the San Miguel River in segments 21, 22c, or 24. Segment 24 in alternative D also crosses Naturita Creek. The number of perennial stream crossings range from 4 to 6 for the five alternatives, and the number of intermittent stream crossings range from 4 to 21. The preferred alternative, A, crosses the San Miguel River, 4 other perennial streams, and 11 intermittent streams. Only Alternative C crosses fewer perennial streams than the preferred alternative.

Norwood Substation Site to Montezuma-La Plata County Line

If a 345-kv tap line into the Lost Canyon Substation were constructed, each alternative would cross the Dolores River in segment 29d. If a 345-kv tap line is not constructed, the preferred alternative would cross the Dolores River in segment 30b, the Middle and East Mancos Rivers in segment 30e, and the West Mancos River in segment 30d. It also crosses 4 other perennial streams and 16 intermittent streams. Alternative A crosses the Mancos River in segment 30c, the Middle and East Mancos Rivers in segment 30e, and the West Mancos River in segment 30d. It also crosses 3 other perennial and 17 intermittent streams. Alternative C crosses three rivers: the Dolores River in segment 30a, and the Middle and East Mancos Rivers in segment 30e. It also crosses 7 other perennial and 22 intermittent streams.

Montezuma-La Plata County Line to Long Hollow Substation
All five alternatives for this section cross the La Plata River at least once, in segment 31f, 32c, or 32b. Alternative D crosses the river twice in segment 32b.

The number of perennial stream crossings range from 2 to 4, and intermittent streams from 2 to 6. The preferred Alternative, C, has the least number of stream crossings. It crosses the La Plata River, one other perennial stream, and three intermittent streams.

Long Hollow Substation to San Juan Generating Station
Three of the four alternatives for this section would cross the La Plata River once. Alternative D would cross the river six times. The number of perennial stream crossings range from 2 to 8, while the number of intermittent stream crossings range from 16 to 29.

The preferred Alternative, B, would have the least impact to water resources, as it crosses the La Plata River once, one other perennial stream, and 16 intermittent streams.

Long Hollow to Durango Substation 115-kv Corridor
This corridor would not cross a major river. Two perennial and five intermittent streams would be crossed.

In summary, the preferred aternative crosses a total of 29 perennial and 127 intermittent streams.

5.3.5 Secondary Impacts
There are no known secondary impacts from the proposed transmission line on water resources.

5.3.6 Cumulative Impacts
There are no known cumulative impacts from the proposed transmission line on water resources.

5.3.7 Adverse Impacts Which Cannot Be Avoided
There are no known adverse impacts to water resources which would result from the proposed project if the proposed mitigation is employed.

5.4 Impacts on Vegetation
5.4.1 General Transmission Line Impacts
Impacts to vegetative communities which would result from the construction of the proposed transmission line include vegetation

removal and/or trimming along the ROWs, along access roads, and in staging areas.

Subsequent to construction and the reestablishment of vegetation in disturbed areas, few operational and maintenance related impacts to vegetation are expected.

The land required for a ROW would be considerably larger than areas occupied by line facilities for the life of the line. Tower structures would occupy approximately 22 ha (54 acres), and access roads about 0.8 ha (2 acres) for each mile of transmission line. The ROW would not be clear cut except as required at structure locations and in areas where new access is required. Other vegetation within the ROW would not be cut except to provide a safe operating clearance for conductors. Vegetation removal would not be noticeable in most of the vegetative communities.

The new proposal would have less impact on conifer-aspen, pinon-juniper, and mountain shrub communities than the original double-circuit project proposal, but would affect a greater amount of sagebrush-grassland, barren, and saltbush-greasewood areas. The smaller base dimension of the single-circuit tower would decrease the amount of vegetation displaced permanently by approximately 44 percent from the original proposal. The reduced dimensions may also reduce clearing requirements at each tower site.

5.4.2 Substation Impacts

Expansion and modification to the existing substations would require vegetation removal and grading on approximately 8 ha (20 acres) of land. Construction of the Long Hollow Substation would require vegetation removal and grading on approximately 4 ha (10 acres). All vegetation would be removed from substation sites and regrowth would be prevented by a layer of crushed rock and soil sterilents spread over the immediate substation area. The total land involved for all three existing substations would be approximately 8 ha (20 acres). The new Long Hollow Substation would also require 4 ha (10 acres) and additional lands would be needed for access roads and equipment storage during construction.

The consequences of construction are dependent in part on the type of vegetation in which construction would occur, in addition to the amount of area to be disturbed. Other factors influencing construction impacts include season of year, weather conditions, type of equipment and type of construction required.

Expansion of the existing substations is not expected to have significant adverse impact on vegetative communities. The vegetation communities that would be removed include, sparse sagebrush for the Grand Junction Substation, and mountain shrub and pinon-juniper for the Montrose and Durango Substations. These vegetative communities are common throughout much of southwest Colorado and such removal would not represent a significant adverse impact to plant communities.

The new Long Hollow Substation would be constructed in an open area within the sagebrush and pinon-juniper plant communities; therefore, significant adverse impacts are not expected. The nearest road from which a new access road could be constructed is a secondary road located approximately 0.8 km (0.5 mile) from the proposed substation site.

5.4.3 Mitigation

Protection of vegetation would be given consideration throughout the planning and construction phases of the project. In wooded areas, tower structures would be sited to reduce the disturbance of trees, where possible. Appropriate precautions against fire would be taken during construction and maintenance. Existing corridors and access roads would be used whenever practical to reduce potential impacts to undisturbed areas. Prior to designating access routes and staging areas, the appropriate landowner or landmanager would be consulted. Respective land management agencies would also be consulted during transmission line design, which includes location of the transmission line, tower sites, pull sites, etc. The joint USDA and USDI publication Environmental Criteria for Electric Transmission Systems would be followed to the extent practicable during the design, construction, and maintenance of the proposed transmission line.

Disturbed federal lands not committed for the life of the project would be allowed to return to their original state or would be revegetated according to SCS recommendations or BLM and FS requirements as stipulated in Environmental Criteria for Electric Transmission Systems. Riparian areas would be avoided or spanned wherever practicable. Existing trees and shrubs in the ROW would be properly "feathered" to create curved undulating boundaries, while allowing for safe operation of the line.

Maintenance personnel are expected to require entry on the ROWs one to two times per year. More frequent entry may be required if operational problems occur on the line. In the event that soils or vegetation are damaged during emergencies or storms, restoration procedures would be the same as those employed during

and after construction. During maintenance inspections, any problems with conductor clearance or soil erosion would be noted and corrected. Public access to the ROW would be restricted according to landowner or landmanager request.

Pesticides and herbicides would not be applied to the ROW. In and near substations, only chemicals recommended by the appropriate authorities, such as the USDA and USDI, would be employed. Chemicals would be applied in accordance with the Federal Insecticide, Fungicide and Rodenticide Act of 1972.

With the exception of the new substation at Long Hollow, construction would be within or immediately adjacent to existing substations. This would minimize disturbances to presently undisturbed areas.

5.4.4 Alternative Corridor Impact Comparison

The impacts to vegetation along the alternative corridors are discussed by line section. Further detailed information on the vegetative communities which would be impacted by the construction of the transmission line is presented in Figures 4-12 through 4-32 in Section 4.12.

Rifle Substation to Grand Junction Substation

The preferred alternative, H, would have a low potential to impact natural vegetation, relative to the other alternatives. Alternative H would cross 70.2 km (43.9 miles) of pinon-juniper vegetation. The alternative would also cross 5.1 km (3.2 miles) of saltbush-greasewood, 6.9 km (4.3 miles) of mountain shrub, and 1.6 km (1.0 mile) of conifer-aspen vegetation.

Alternatives B and C have the lowest natural vegetation impact scores (See Table 3-7); however, they cross more agricultural vegetation than H. Alternative A is similar to H in vegetative ecotypes crossed but has greater potential to impact conifer-aspen vegetation.

Vegetative impacts in alternatives D, E, F, and G would be similar due to the common corridor segments 4 and 5a. The greater potential for vegetative impacts for these corridors is a function of their total length, and the crossing of ecotypes that would be sensitive to impact, mountain shrub and conifer-aspen.

Grand Junction Substation to Montrose Substation

None of the corridors for this section cross conifer-aspen, mountain shrub, sagebrush-grassland communities, or barren ground.

All three alternatives would cross 43.4 km (27.1 miles) of saltbush-greasewood vegetation. The only difference in the impacts caused by the three alternatives is in the amount of pinon-juniper vegetation crossed. Alternative A crosses 14.4 km (9.0 miles), Alternative C 30.7 km (19.2 miles), and Alternative B, the preferred corridor, crosses 17.6 km (11.0 miles) of pinon-juniper vegetation.

Montrose Substation to Norwood Substation Site

All five of the alternative corridors for this section would impact the conifer-aspen community. Alternative C would cross the least conifer-aspen, 24.5 km (15.3 miles), while the preferred alternative, A, would cross 24.8 km (15.5 miles). Alternative B, D and E would cross 34 km (21.2 miles), 37 km (23.3 miles) and 26 km (16.4 miles) of conifer-aspen vegetation, respectively.

None of the corridors would cross saltbush-greasewood or sagebrush-grassland communities, or barren ground.

The preferred corridor would also cross 13.9 km (8.7 miles) of pinon-juniper vegetation, and 25.3 km (15.8 miles) of mountain shrub vegetation. Alternatives C and E would have a lower impact potential than the preferred corridor.

Norwood Substation Site to Montezuma-La Plata County Line

The potential impacts to vegetation would be similar for all alternatives in this line section if a 345-kv tap line to Lost Canyon is not constructed. All three alternatives would cross a substantial amount of conifer-aspen vegetation, with alternatives B and C crossing 5.3 km (3.3 miles) and 4.8 km (3.0 miles) more, respectively, of this ecotype than Alternative A. Alternative A would cross 7.2 km (4.5 miles) more mountain shrub vegetation than alternatives B or C.

If a 345-kv tap line to Lost Canyon were required, Alternative C would impact 17.3 km (10.8) additional miles of conifer-aspen vegetation. Alternative B would impact one additional mile of this vegetative ecotype.

Montezuma-La Plata County Line to Long Hollow Substation

There are five alternative corridors for this section. All five would impact conifer-aspen vegetation. The preferred alternative, C, would cross 9.6 km (6.0 miles) of conifer-aspen vegetation. Alternatives A and B would cross 5.6 km (3.5 miles) each, while Alternative E woiuld cross 14.2 km (8.9 miles) and Alternative D, 17.6 km (11.0 miles), of conifer-aspen.

Alternatives A and B would cause fewer overall impacts to vegetation than the preferred alternative, C. Alternative A crosses only conifer-aspen and pinon-juniper communities, and barren ground. Alternative B crosses conifer-aspen, pinon-juniper, and mountain shrub communities. Alternatives D and E would cause more impacts to vegetation than the preferred alternative.

Long Hollow Substation to San Juan Generating Station

Four alternative corridors are evaluated for this section. Potential vegetation impacts for all four alternatives are similar since they cross the same types of vegetation. Alternative D would cross 1.6 km (1.0 mile) of conifer-aspen vegetation, none of the other alternatives cross this ecotype.

Alternatives A and B would impact similar amounts of pinon-juniper and sagebrush-grassland vegetation. Alternatives C and D would impact more pinon-juniper vegetation but less sagebrush-grassland vegetation than A and B.

Impacts to vegetation for this section of line would be lower since vegetative types that are less sensitive to impact are crossed.

Long Hollow Substation to Durango Substation

The 115-kv line would traverse approximately 4.8 km (3.0 miles) of conifer-aspen vegetation and 3 km (2 miles) of mountain shrub vegetation.

A 46 m (150 foot) ROW would require 7.3 ha per km (18.2 acres per mile). However, vegetation would not be removed along the entire ROW; it would only be removed permanently at tower sites and where tall trees would be removed or topped for safety reasons. Assuming 2.7 towers per km (4.4 towers per mile) and a base dimension of approximately 84 square meters (900 square feet), and also considering the double-circuit towers with a base dimension of 144 square meters (1600 square feet) would be used in segment 14c and might be used in segment 29d, the following vegetation types would be permanently removed from the proposed corridor.

	km	(miles)	ha	(Acres)
Conifer-Aspen	100	(63)	3	(6)
Pinon-Juniper	126	(79)	3	(7)
Saltbush and Greasewood	48	(30)	1	(3)
Mountain Shrub	46	(29)	1	(3)
Sagebrush and Grassland	45	(28)	1	(3)
Barren Ground	10	(6)	0.2	(1)
Total	375	(235)	9.2	(23)

Additional area around each structure would also be temporarily disturbed to allow for the placement of construction equipment and associated construction activities. Such disturbance could amount to 753 square meters (8,100 square feet) per structure site.

Segments crossing more than 16 km (10 miles) of conifer-aspen communities include segments 3c, 19a, 20a, 25b, 29b, 29c, and 30a. The participant's preferred corridor would cross approximately 100 km (63 miles) of conifer-aspen vegetation.

5.4.5 Secondary Impacts

The direct impact of vegetation removal along the ROW, access roads, and substation sites from construction activities can result in a variety of secondary effects. Each is discussed separately below.

Increased erosion potential would be expected when the vegetation that binded and protected the soil is removed (See Section 5.2). This would be a secondary effect since it would be caused by vegetation removal instead of direct construction impacts.

Wildlife populations would be affected by the permanent removal of cover, nest site locations, and food resources for those animals that previously used the unaffected ROW. The magnitude of the impact would depend on the importance of the habitat removed as a wildlife resource. The displaced animals would move into adjacent areas that are already supporting populations; however, considering the narrowness of the actual area of the ROW that would be affected and the small areas required for substations, this displacement is expected to be minimal.

Although some wildlife species would be adversely affected, others may actually benefit from ROW preparation. Removing small areas of vegetation within much larger areas of similar habitat type can create an edge effect (Odum 1971). This secondary effect may increase the diversity of wildlife species as a result of increasing the diversity of habitat type (Anderson 1977). It may also increase the overall utilization of the ROW by wildlife (Mayer 1976). The edge effect would be most dramatic in densely forested areas where tall trees would gradate to smaller trees and shrubs and finally grasses and forbs. The effect may not be as evident in shrub and grassland habitats (Griffith 1977). Wildlife would likely benefit from this improvement in the diversity of habitat along the ROW (Mayer 1976, Fletcher and Busnel 1978).

Another secondary effect of vegetation disturbance is the vulnerability of the area to invading weed species, such as Russian thistle (WPRS 1976). These weed species would compete with desirable native species for exposed sites and slow the return of those areas to original native vegetative cover. This effect would be most evident where little ground cover remains after construction, and would be mitigated by proper reclamation techniques.

5.4.6 Cumulative Effects

The BLM has analyzed the cumulative regional disturbance to vegetation that would occur from future urban and industrial expansion in west-central Colorado (BLM 1978c). Approximately 40,115 ha (99,050 acres) were projected to be disturbed in 1980, 11,380 ha (28,100 acres) in 1985, and 14,540 ha (35,900 acres) in 1990. The area considered included Garfield, Mesa, Delta, Pitkin, Montrose, Gunnison, and Ouray Counties, comprising the northern part of the Rifle-San Juan Project study area. The estimates included expansion of existing energy projects, new energy projects, community expansion, road construction, transmission lines, pipelines, and telephone lines.

No comprehensive study for the southern half of the proposed project study area exists. However, a review of the available environmental documents on the various proposed projects in the southern half of the study area reveals that about 10,000-15,000 ha (25,000-37,500 acres) would be disturbed by the various water projects, pipelines and other developments within the next ten years.

The Rifle-San Juan Project would commit a total of approximately 22 ha (54 acres). This area represents the total area removed by towers and substations. Only where these structures and facilities are located would a permanent disturbance occur. The total amount of land disturbed by tower placement would be about 10 ha (24 acres). Substation and switchyard additions would require another 12 ha (30 acres).

5.4.7 Adverse Impacts Which Cannot Be Avoided

Unavoidable impacts are those effects that remain even after the application of appropriate mitigation measures. Unavoidable vegetation impacts would result from the permanent disturbance of land at tower, substation, and access road locations. In addition, trimming of some large trees along the ROW to assure safe clearance for conductors would be required. This trimming of vegetation would not be clear cutting, but rather a "feathering" of the ROW, removing only those trees that pose a safety hazard.

The permanent removal of approximately 22 ha (54 acres) of vegetation would result from the placement of towers and substations. Additional vegetation would be removed by access road construction. The preferred corridor would cross 100 km (63 miles) of conifer-aspen communities in which the removal and trimming of trees may be necessary.

5.5 Impacts on Wildlife

5.5.1 General Transmission Line Impacts

The impacts to wildlife from construction, operation and maintenance depend on the time and location of tower construction and access road construction. Most impacts are short-term, occurring only during the construction period. Short-term effects include the disturbance of wildlife in construction and staging areas and temporary disturbances to vegetation. Long-term effects include the vegetation removal for access roads. Wild horses, deer, elk, and pronghorn antelope may avoid areas where construction crews are present. However, these impacts are not expected to result in significant long-term adverse impacts to wildlife populations. The great blue heron rookery, located east of the Roubideau Creek and Gunnison River confluence, would be avoided. Effects of the proposed project that relate to potential long-term impacts on wildlife populations are related to access road constuction, timing of construction, noise, maintenance activities, and avian collision and electrocution potential, as discussed below.

Construction disturbances could disrupt normal behavior of elk and mule deer during crucial stages of their life cycle, such as wintering, migration, or fawning and calving periods. Operation of a line crossing migration routes is not expected to be a problem to migrating animals. Noise associated with the proposed transmission line is not expected to have significant adverse impacts on wildlife.

Maintenance personnel are expected normally to require entry on the ROW one to two times per year to make routine inspections, repairs, and keep conductors and support structures clear of vegetation. Additional entries may be required to repair the line during emergencies. Major repairs in the winter months may disturb winter deer populations; however, brief and infrequent inspections and maintenance are not expected to have significant impacts on wildlife.

The proposed transmission line does not lie within the principal waterfowl migration corridors and is not expected to pose any serious threat to migrating birds. The CDOW believes that water-

fowl mortality due to avian collisions with the transmission line would not be a significant problem.

A variety of bird life including ravens, eagles, hawks and turkeys are known to utilize transmission structures for roosting, nesting, and sites from which they search for forage (Fletcher and Busnel 1978). Design features such as adequate separation of the energized conductors and other parts of the support structures would effectively eliminate the possibility of electrocuting raptors and other birds that may use the structures for nesting and perching.

Overall, the construction of the proposed 345-kv transmission line is not expected to have a significant adverse impact on wildlife.

5.5.2 Substation Impacts

The existing Rifle Substation is located within mule deer and elk critical winter range; and the Durango Substation is located within mule deer and elk fawning and calving areas. The existing Grand Junction Substation and San Juan Switchyard are not located in concentration areas or ranges of large mammals.

Up to 3 ha (8 acres) would be cleared at the Montrose Substation, 5 ha (12 acres) at the Grand Junction Substation and 0.2 ha (0.5 acre) at the Durango Substation. No significant habitat for wildlife would be disturbed at any of these existing substation sites. Potential adverse impacts to big game animals and other wildlife are expected to be insignificant since construction would be adjacent to existing substations. Wildlife in the vicinity of these sites have likely become accustomed to the existing substation facilities. Upgrading the existing facilities is not expected to cause significant changes in animal behavior or loss of available forage. There would, however, be some avoidance of the sites by wildlife during construction.

Construction of the new Long Hollow Substation would occur in a mule deer fawning and elk calving area and critical winter range. New construction would require a longer time period than that for substation expansion work; therefore, potential disturbances to wildlife would be of a longer duration. As at the existing substations, increased human activity during construction may cause some wildlife to temporarily avoid the construction area.

Although some wildlife habitat would be lost during project development, the overall impact from the substation portion of

the project is expected to be minimal due to the very localized and small area of disturbance.

5.5.3 Mitigation

Timing of construction activities would be planned in coordination with land management and fish and wildlife agencies to minimize disturbance to the reproductive seasons of elk, mule deer and antelope. Special attention would be given to the months of May through July to avoid disturbance to the calving and fawning activities. Mule deer and elk migration areas and critical winter range would be identified and avoided during critical months. Critical winter months may include November through May, but the exact period may vary from year to year and in specific locations within the study area. Critical wildlife areas, and periods during which they would be avoided by construction activities, would be specified during the ROW approval process. Human disturbance to wildlife within the ROW could be restricted by blocking or locking gates to ROW access roads as designated by land management agencies and landowners.

Riparian vegetation and wetlands would be avoided or spanned, where practical, to protect wildlife indigenous to these areas. Waterfowl concentration areas would be avoided where practical. Additionally, the transmission line would be designed to be as high above water surfaces as practical.

5.5.4 Alternative Corridor Impact Comparison

The impact to wildlife along the alternative corridors is dependent upon the amount of critical and sensitive habitats traversed and the indirect impact resulting from disturbances to particular ecotypes. Surface disturbance to the riparian and conifer-aspen ecotype could indirectly impact wildlife the most due to habitat elimination. However, where the line would parallel an existing ROW, the vegetation that would be removed is not expected to have an adverse impact on wildlife when considering the known utilization of transmission rights-of-way by wildlife (Fletcher and Bushel 1978).

The impact discussion under vegetation takes wildlife impacts into consideration and is the basis for the total impact ranking along each alternative corridor. The wildlife discussion here is limited to the amount of sensitive habitat traversed. The total impact rating for each alternative is summarized in Section 3.7.

Rifle Substation to Grand Junction Substation

The preferred alternative (H) traverses 36.6 km (22.0 miles) of critical deer and elk winter range. Alternatives D, E, F and G

each cross 27.8 km (16.7 miles) of critical deer and elk winter range in Segment 4 alone and an additional 7.8 km, (4.7 miles), 13.6 km (8.2 miles), 19.2 km (12.0 miles) and 14.2 km (8.5 miles), respectively. Segments 3a and 3q are common to alternatives A, B, C and H, traversing 10.3 km (6.2 miles) of critical deer and elk winter range. In total, Alternatives A, B, C and the preferred corridor cross an additional 24.8, 25.9, 10.4, and 25.2 km (15.5, 16.2, 6.5 and 15.8 miles), respectively.

The preferred corridor crosses more big game critical winter range in the Colorado River Valley than A or C, and fewer miles of critical habitat than alternatives B, E, F, and G in this section. Alternative C and the preferred corridor traverse more fawning and calving areas than the other alternatives. However, considering construction would be scheduled to avoid big game critical winter range and reproduction areas during sensitive times, the impacts on wildlife from the proposal would be reduced.

Grand Junction Substation to Montrose Substation

Segments 5b and 12 are common to all the alternatives and cross 24.8 km (15.5 miles) of big game critical winter range, and no fawning or calving areas. Alternative C crosses an additional 18.4 km (11.5 miles) of big game critical winter range and, therefore, has the greatest impact potential in this section. The preferred alternative (B) crosses an additional 6.0 km (2.5 miles) of big game critical winter range. Alternative A crosses an additional 2.4 km (1.5 miles) of critical winter range and, thus, has the least impact potential.

All three alternatives would cross pronghorn antelope range between Grand Junction and Delta. Due to the extent of the antelope range and the mobility of the species, disturbances to the pronghorn would be expected to be minimal.

Montrose Substation to Norwood Substation Site

Alternatives B, E and the preferred corridor (Alternative A) cross 14.6 km (9.1 miles) of critical winter range in Segment 21 between the southern Uncompahgre National Forest boundary and Norwood. Additionally, the preferred corridor traverses 13.6 km (8.5 miles) of critical winter range while Alternatives B and E traverse about 9.6 km (6.0 miles) and 9.1 km (5.7 miles), respectively. The total winter range impacts are 28.2 km (17.6 miles) for the preferred corridor, 24.2 km (15.1 miles) for B and 23.7 km (14.8 miles) for E. Alternatives C and D cross less critical winter range, 21.6 and 16.3 km (13.5 and 10.2 miles) respectively, than the preferred Alternative A.

Segment 24 within Alternative D traverses 8 km (5 miles) of area with known wild horse herds. The amount of fawning/calving area traversed by the alternatives is about the same. Overall, alternative D would have the least potential to impact big game species.

Norwood Substation Site to Montezuma-La Plata County Line
The amount of big game critical winter range and fawning/calving area traversed in this section is minimal. Each alternative traverses the same amount of critical winter range 3.2 km (2.0 miles) and fawning/calving area 8.0 km (5.0 miles).

Montezuma-La Plata County Line to Long Hollow Substation
None of the alternatives traverse any critical winter range in this section. Alternative A traverses the most fawning/calving area 24.2 km (15.1 miles) and the preferred corridor (Alternative C) the least 8.6 km (5.4 miles). Alternatives B, D, and E cross 16.8, 17.0, and 16.8 km (10.5, 10.6, and 10.5 miles), respectively. Alternatives D, E and the preferred cross elk/mule deer migration routes. Overall, Alternative A has the greatest potential to impact mule deer and elk.

Long Hollow Substation to San Juan Generating Station
There is no critical winter range traversed in this section by any alternative. However, about half of the section is located in elk calving and mule deer fawning area as shown in Figure 4-6. The preferred alternative (B) crosses 20.2 km (12.6 miles) of this area, Alternatives A, C, and D cross 20.2, 29.8, and 54.4 km (12.6, 18.6, and 34.0 miles), respectively. Alternative D has the greatest potential to impact big game in this section.

Long Hollow to Durango 115-kv Corridor
Roughly 11.2 km (7 miles) of big game fawning/calving area is crossed by the 115-kv corridor.

5.5.5 Secondary Impacts
Wildlife populations could be affected by the permanent removal of cover, nest site locations, and food resources for those animals that previously used the unaffected ROW. The magnitude of the impact would depend on the vegetative ecotype removed. The displaced animals would likely move into adjacent areas that are already supporting populations. However, considering the narrowness of the actual area of the transmission line ROW that would be affected and the small areas required for substations, this displacement is expected to be minimal.

Careful route selection is expected to minimize the removal of trees; however, some clearing and trimming, especially in forested areas, would be needed. This alteration of habitat is likely to result in a secondary effect of increased forage for big game species. Bear, deer, elk, and bighorn sheep would benefit from additional forage and new growth of vegetation along the transmission line ROW.

Transmission towers are typically used as roosting, perching and nesting sites by a variety of bird species, particularly raptors (Fletcher and Busnel 1978). The open spaces within the ROW provide lines of sight for these predators to locate prey, such as rodents, from the vantage point of a tall tower. Location of towers in areas where limited or no perching sites existed could cause an increase in raptor density along the ROW and a subsequent increase in the hunting pressure on resident prey populations.

Improved access to the areas traversed by the ROW could result in both adverse and favorable secondary impacts. An adverse effect would involve the increased wildlife disturbance that may result from harassment and unlawful hunting in or near the ROW. The impact of this human intrusion would be greatest during sensitive reproductive times such as big game calving and fawning periods.

Lawful hunting is controlled by the respective state wildlife agencies, the CDOW and the New Mexico Department of Game and Fish. Improved access to lawful hunting areas would be a beneficial effect to hunters during the appropriate hunting seasons. Other recreational activities such as bird-watching and hiking may also be improved by ROW location.

5.5.6 Cumulative Impacts

The Rifle-San Juan Project would contribute to the overall cumulative reduction in available wildlife habitat in the region. The primary reduction from this project is due to the surface disturbance of approximately 22 ha (54 acres) by construction of towers and substations, and an additional amount of access roads. Trimming of vegetation along the route for clearance would further reduce the vegetative cover of the area. However, some improvement in the quality of habitat may occur as a result of the "feathering" of vegetation away from the ROW centerline. Therefore, it is difficult to assess the net effect of the project as it relates to regional wildlife habitat changes.

5.5.7 Adverse Effects Which Cannot Be Avoided

Wildlife would be unavoidably affected by loss of nests, cover, and food resources, and by temporary disturbance by construction and maintenance crews. The net effect would depend on the density of animal species in the area traversed by the line, and the utilization of the habitat type that would be removed.

Particularly sensitive areas would be those calving and fawning areas used by large mammal species during critical reproductive periods. A minimum of 36 km (22 miles) of such sensitive habitat occurs along even the best corridor alternative from this perspective. However, impact in these areas would be avoided by proper timing of construction to avoid these sensitive reproductive periods. Therefore, unavoidable adverse impacts on calving and fawning areas are not expected.

5.6 Impacts on Wetlands and Floodplains

5.6.1 General Transmission Line Impacts

Wetlands

The wetlands that exist within the proposed corridors include:

1. Riverine: The area within the channel of rivers and streams. This type of wetland is bounded by the channel banks. It normally is innundated by flowing water but may be dry during parts of the year as in intermittent stream channels;
2. Lacustrine: Areas of standing water in reservoirs, ponds or potholes; and
3. Palustrine: Wetlands dominated by persistent nonaquatic plants.

Because of the rugged terrain and semi-arid climate, most wetlands are narrow enough to be spanned by the proposed transmission line. As described in Section 4.10, some areas identified as wetlands or marshes on topographic maps, or that appeared to be subject to poor drainage, were found to exist within the corridor network. Ten of these areas had a width greater than 305 m (1,000 feet), which include:

Wetland Area	Segment
Colorado River	3e
Kannah Creek	5b
Gunnison River	5b/12

Spring Creek	14d/14b
Garley Ditch	21
Unnamed	29b
Dolores River	29d
Dolores River	26
La Plata River	35b
2 Unnamed	36b

These wetlands were considered potentially significant in that they may be too wide to be spanned by the proposed transmission line. The other narrower wetland areas are considered insignificant since they can be easily spanned.

The potentially significant wetland areas were examined by biologists to determine if they were in fact wetland areas and if they could be spanned by the proposed project. No potentially significant wetlands were determined by aerial examination and map review to be greater than 305 m (1,000 feet); and, therefore, were not considered to be significant wetlands. Since no wetlands were identified within any corridor that could not be avoided or spanned, one corridor cannot be considered more suitable than another in regard to potential impacts on wetlands. Based on the above, REA has determined that there will be no adverse impacts to wetlands.

Riparian Areas

The potential for the proposed project to affect riparian areas was evaluated through enumerating stream crossings as listed in Tables 3-7 through 3-12. Although both intermittent and perennial stream crossings are included, the potential impacts are greater for perennial stream crossings where the riparian vegetation is expected to be more fully developed. As part of the aerial survey to define the significant wetland areas, two significant riparian areas of width greater than 305 m (1,000 feet) were identified. They are the crossings of the Colorado River in segment 3e. Impacts to riparian vegetation would be greatest when traversing perennial streams with broad floodplain areas.

In most cases, it is expected that intermittent streams can be spanned. Perennial streams in highly dissected areas (mountainous terrain) are also likely to be spanned. Therefore, low and medium impact potential to intermittent and perennial stream crossings would occur.

Floodplains

The U.S. Corps of Engineers was consulted regarding the potential of the proposed project for impacting floodplains and

floodwaters. The Corps of Engineers has stated that the majority of floodplains crossed by the proposed project would be less than 305 m (1,000 ft), which is less than the proposed maximum distance between support structures. Most of the alternative segments are located in unpopulated areas and floodplain information is practically nonexistent (Corps of Engineers 1981).

The potential for constructing support towers in a 100-year floodplain increases with the occurrence of major rivers within a segment. Therefore, the major river and floodplain areas that the proposed project may cross (Figure 4-11) were investigated by using Flood Hazard Boundary Maps provided by the U.S. Department of Housing and Urban Development (HUD). After reviewing the 100-year floodplains identified in the HUD maps, it was concluded that the floodplains could potentially be spanned by the proposed project. However, topography, soils, angle of approach to a floodprone area, and other engineering considerations may require constructing towers within the 100-year floodplain.

The necessity of locating support structures within 100-year floodplains is not expected to reduce the reliability of the proposed project or have a significant adverse impact on flood water flow. The Corps of Engineers indicated that it does not normally view the placement of transmission towers in the floodplain as having the potential to cause significant impact on flooding (Corps of Engineers 1981). The anticipated 305 m (1,000 feet) distance between support structures would allow towers to span those portions of the floodplains where the likelihood and severity of flooding is expected to be greatest. In addition, towers and footings for structures to be placed in floodplains would be designed with consideration given to foundation conditions and loads to be encountered. The specific areas where support structures, access roads, or stream crossings would require construction in a floodplain would be identified during the ROW approval process.

Access roads and stream crossings may require construction in a floodplain; however, this would be avoided whenever practical alternatives exist. Such structures would be subject to floodwater damage and would be designed to withstand highwater flows. Temporary structures (culverts, crossing structures, etc.) would be removed when they are no longer needed.

Based on the above, REA has determined that no practical alternative to crossing a floodplain may exist. The proposed project would be designed to minimize potential harm to or within the floodplain.

5.6.2 Substation Impacts

None of the proposed substation facilities would be located in wetlands or floodplain areas, so there would be no impacts.

5.6.3 Mitigation

Wetlands and Riparian Areas

Wetlands and riparian areas would be avoided where possible during the delineation of the ROW, tower locations and substation facilities. Wetlands and riparian areas that cannot be entirely avoided would be spanned without construction in the wetlands. Wetlands would be avoided during maintenance of the proposed project. In addition, damage to wetlands and riparian areas would be minimized by implementing the following:

- Construction of access roads would not be permitted in wetlands.

- Sediment control structures would be used near wetlands.

- Riparian vegetation would not be removed except for tall trees that conflict with transmission line operation.

- Fill material would not be placed in wetlands.

- Any lubricating oils or fuel for equipment motors would be carefully handled and disposed.

Floodplains

Floodplains would be avoided where possible. Those floodplains which cannot be completely avoided would be spanned without construction in the floodplain if possible.

Any tower structures that must be built in floodplains would be designed to withstand the 100-year flood. Structures would be placed where the likelihood and severity of flooding is expected to be lowest.

5.6.4 Secondary Impacts

No secondary impacts on wetlands or floodplains would be caused by the proposed transmission line.

5.6.5 Cumulative Impacts

No cumulative impacts on wetlands or floodplains would be caused by the proposed transmission line.

5.6.6 Adverse Impacts Which Cannot Be Avoided

With adherence to the proposed mitigation measures, no unavoidable adverse impacts on wetlands or floodplains are expected.

5.7 Impacts on Threatened and Endangered Species

5.7.1 General Transmission Line Impacts

The impacts to threatened or endangered wildlife or plants from transmission towers and lines would vary depending upon the species, the placement of towers, and the season of construction.

In order to ensure that threatened and endangered species receive appropriate consideration, a revised Biological Assessment is being prepared and REA will consult with the USFWS on any effects this project may have on these species.

Plant Species

The spineless hedgehog, Uinta Basin hookless, and the Mesa Verde cacti occur in the study area.

Maps showing regions where special status plants may occur in the study area were prepared by Ecology Consultants, Inc. (a subsidiary of Environmental Research and Technology, Inc., of Fort Collins, Colorado) for use during selection of the alternative transmission line corridors. These regions were avoided during corridor selection where practical. In addition, tower sites and access road locations would be surveyed where required prior to construction to identify any endangered and threatened plant species.

Animal Species

Black-Footed Ferret: It cannot categorically be stated that the black-footed ferret does or does not presently exist in the study area; however, no confirmed sightings have been reported in recent years. Until the presence of black-footed ferrets is confirmed, the CDOW (1978) considers no area in the study area as essential ferret habitat. Although known prairie dog towns are avoided to a large extent by the selection of the preferred corridor, some areas indicated as containing large prairie dog populations may be crossed by the proposed project (Figure 4-7). The construction and operation of the proposed transmission line is not expected to have a significant adverse impact on prairie dog populations or their habitat. Therefore, the proposed project is not expected to adversely affect the black-footed ferret.

Bald Eagle: Bald eagles may temporarily avoid areas where construction crews are present. The proposed project would not approach within approximately 11.2 km (7 miles) of areas where

bald eagle nests are known to occur, but would pass near bald eagle roosting areas. If additional active nest sites are identified within the corridor prior to construction, they would be avoided during centerline location. Known winter range concentration grounds, feeding areas, and winter roosting sites for the bald eagle in the study area were mapped and are shown as hunting and concentration areas in Figure 4-7. The proposed project would not interfere with active nesting areas and would be designed to minimize impacts to riparian woodlands which are sometimes used as roosting areas by the eagle. Construction near rivers may be restricted during winter roosting periods (December-March) for bald eagles. In addition, the line will be constructed adjacent to existing lines wherever practicable. Therefore, it is unlikely that the construction or presence of the proposed project would have a significant adverse effect on the continued survival and reproduction of the bald eagle.

Peregrine Falcon: Hunting and nesting areas for the peregrine falcon were drawn on maps. In order to protect the endangered falcon from public harassment, hunting and nesting areas are omitted from Figure 4-7 by request of the CDOW, who reviewed the complete maps for accuracy. The proposed project avoids all known active and potential nesting areas that occur in the study area. If additional active nest sites are identified prior to construction they would be avoided during centerline location. Lines passing several miles away from nesting areas would not constitute a significant negative impact to the peregrine falcon (CDOW 1980a, 1980b).

On the basis of the above comments, the construction and operation of the proposed transmission line is not expected to adversely impact the continued survival and reproduction of the peregrine falcon.

Threatened and Endangered Fish: The Colorado squawfish occurs within the study area and is considered federally endangered. Other species, including the bonytail chub, humpback chub, razorback sucker, and roundtail chub, are designated threatened or endangered by the USFWS or the States of Colorado or New Mexico.

The proposed transmission line would not have significant adverse impacts on aquatic organisms or their habitat. Measures to control soil erosion and minimize subsequent siltation of streams would be employed during construction and operation of the proposed line. No blockages or alterations of stream flow would be required. Where possible, rivers and streams would be spanned and no structures would be placed in the river beds.

<u>State Endangered Species</u>: The wolverine, river otter, and the Colorado River cutthroat trout are listed as threatened or endangered in Colorado. No recent confirmed sightings of the wolverine have been made, and no part of the state is currently considered essential habitat. The river otter was extirpated in Colorado, but has been recently reintroduced into the Gunnison River drainage. The Colorado River cutthroat trout occurs in two locations in the state, one of which (Northwater Creek) occurs near the northern boundary of the study area.

The Mississippi kite and the red-headed woodpecker are considered endangered in New Mexico. The Mississippi kite and the red-headed woodpecker are generally associated with riparian habitat and planted groves in New Mexico (New Mexico Department of Game and Fish 1978). Known areas where these species have been observed or where there is potential for their occurrence are shown on Figure 4-7. The proposed transmission line is not expected to result in significant adverse impacts to the areas where these species are known to occur; however, protective measures would be initiated to protect riparian habitats during construction and operation of the proposed transmission line.

The mink, which is seldom found far from permanent water, is considered endangered in New Mexico. This species is widespread and still common throughout much of its historic range but is declining in numbers in New Mexico (New Mexico Department of Game and Fish 1978). The decline of mink populations in New Mexico may be related to habitat degradation, trapping, disease and interspecific competition (New Mexico Department of Game and Fish 1978). Areas in New Mexico where this species may occur are indicated in Figure 4-7. However, the New Mexico Department of Game and Fish believes the mink has disappeared from the study area. Special protective measures will be used to protect riparian habitat wherever it proves necessary to cross such areas. On the basis of the above discussion the mink is not expected to be adversely impacted by the proposed action.

A Biological Assessment for the original double-circuit line, which addressed several federally threatened and endangered species known to occur in the study area, was submitted to the USFWS in 1981. The USFWS determined that the original project would not jeopardize the continued existence of any plant or animal currently listed. A revised Biological Assessment is currently under preparation on the revised project.

Based on the preliminary information available and the mitigation measures, REA has tentatively determined that the proposed

project would not affect any federally listed threatened and/or endangered species or their critical habitats.

5.7.2 Substations

The existing Montrose, Grand Junction and Durango Substations, which would be expanded under the proposal, are the only proposed or existing substations that occur within the region described as bald eagle hunting and concentration areas. However, no impact to this endangered bird is expected, since no nest or significant eagle habitat would be affected.

No threatened or endangered plant species are known to occur in the construction areas for the substations, but if required surveys would be conducted to determine their presence or absence.

5.7.3 Mitigation

Regions within the study area where the threatened and endangered plant species may occur were identified and avoided to the extent practicable during corridor selection. In addition, during centerline location and prior to construction of access roads and substation facilities, a qualified botanist would inspect the ROW, access roads, and substation sites in the spring in those areas where federally designated threatened and endangered plant species may occur to insure that these species would not be impacted. All such species that are identified would be avoided or, if recommended by USFWS and land management agencies, transplanted prior to construction of the transmission and substation facilities.

Timing of construction activities would be planned based on consultation with the appropriate agency to minimize disturbance to the reproductive seasons of sensitive species. Peregrine falcon and bald eagle nests and eagle roosting sites would be identified and avoided during critical months. Critical winter months may include November through May (BLM 1980b). The exact time frame may vary from year to year and in specific locations within the study area. Critical areas and periods during which they would be avoided by construction activities would be specified during the ROW approval process. Important bald eagle roost sites identified by the BLM, FS, CDOW, or the USFWS would be avoided. The line would be sited to avoid riparian areas where practicable or cross riparian areas at narrow locations. Electrocution is not considered a problem with high voltage transmission lines because conductors are spaced far enough apart to prevent simultaneous contact of the bird's extremities with adjacent conductors (Fletcher and Busnel 1978). All conductors

for the proposed line would be separated by at least 7 m (24 feet). Since the eagle wing span ranges from 1.8-2.4 m (6-8 feet), the proposed conductor spacing would be adequate to prevent electrocution.

5.7.4 Alternative Corridor Impact Comparison

The alternate corridors were evaluated on the basis of km (miles) of bald eagle concentration areas crossed. The possible presence of wolverines, otters, Mississippi kites, red-headed woodpeckers, and suitable habitat for mink and prairie dog towns in the corridors are also discussed.

Rifle Substation to Grand Junction Substation

The number of kilometers of bald eagle concentration areas crossed ranges from 6 to 77 km (3.5 to 48.3 miles) for the eight alternative corridors. Alternatives D, E, F and G would have the least potential impact, as they cross only 6 km (3.5 miles) of concentration areas each. The preferred alternative, H, crosses 32.0 km (20.5 miles). Alterntives A, B, and C cross 47, 72 and 77 km (29.3, 45.1 and 48.3 miles) of bald eagle concentration area, respectively.

Segment 3q in corridors A, B, C, and H (the preferred corridor) each cross 3.2 km (2 miles) of possible wolverine habitat.

Grand Junction Substation to Montrose Substation

Alternative corridors A, B (preferred), and C cross 29 (18.3), 31 (19.6), and 46 km (29 miles) of bald eagle concentration area, respectively. All three alternatives pass through 37 to 40 km (23 to 25 miles) of prairie dog town concentration area and through 1.9 km (1.2 miles) of suitable river otter habitat.

Montrose Substation to Norwood Substation Site

Alternative corridors B and E each cross 3.2 km (2 miles) of bald eagle concentration areas. The preferred alternative, A, crosses 14.4 km (9 miles) of bald eagle concentration area. Alternatives C and D cross 22 (13.6) and 19.5 km (12.2 miles) of bald eagle concentration areas, respectively. All five corridors cross between 4 (2.8) and 22 km (13.6 miles) of prairie dog town concentration areas. The preferred alternative crosses 7 km (4.3 miles). No suitable habitat for state endangered species is crossed by any of the corridors.

Norwood Substation Site to Montezuma-La Plata County Line

Alternatives A, and B would cross 6 and 2.7 km(4, and 1.7 miles) of bald eagle concentration area. If a 345-kv tap line were

constructed alternatives B and C would each cross 6 km (4 miles) of bald eagle concentration area.

Montezuma-La Plata County Line to Long Hollow Substation
No threatened or endangered species would be affected by any of the alternative corridors in this section.

Long Hollow Substation to San Juan Generating Station
Alternative corridor B, the preferred alternative, crosses 1.6 km (one mile) of suitable habitat for Mississippi kites, red-headed woodpeckers, and mink. Alternatives A and B each cross 4.8 km (3 miles) of bald eagle concentration area. None of the other alternatives cross habitats suitable for threatened or endangered species.

Long Hollow to Durango 115-kv Corridor
The proposed 115-kv line would cross 6 km (3.7 miles) of bald eagle concentration area. No other state or federal threatened or endangered species are likely to be affected by this proposed route.

In summary, the preferred alternative would cross 89 km (55.6 miles) of bald eagle concentration areas, 48 km (30 miles) of prairie dog town concentration areas, 3 km (2 miles) of suitable wolverine habitat, 2 km (1.2 miles) of river otter habitat, and 1.6 km (1 mile) of suitable habitat for mink, Mississippi kite, or red-headed woodpecker.

5.7.5 Secondary Impacts

Secondary effects on threatened and endangered species resulting from the construction of the proposed line would be limited. The transmission towers for the line are often used by raptors for roosting and perching sites. The open spaces provided by the right-of-way could provide lines of sight for predators to locate prey, such as rodents, from the vantage point of the structure.

Openings provided by the ROW could also provide additional suitable habitat for prairie dogs and black-footed ferrets. On the other hand, these openings also provide for improved human access, and human disturbance could cause stress to isolated threatened or endangered populations.

5.7.6 Cumulative Effects

The cumulative effects of the development of western Colorado on threatened and endangered species could be adverse, but are difficult to quantify. The impacts of population growth and habitat destruction, if unchecked and not mitigated, could possibly cause

the extinction of some species and could cause other wildlife or plant species to become endangered in the future.

5.7.7 Adverse Impacts Which Cannot Be Avoided

Although impacts to threatened or endangered species are expected to be avoided or mitigated, the proposed corridor would cross areas of bald eagle concentrations, prairie dog towns with possible black-footed ferret populations, and suitable habitat for wolverine, river otter, Mississippi kite, red-headed woodpecker, and mink. There may be some slight unavoidable disturbances to these populations.

5.8 Impacts on Cultural Resources

5.8.1 General Transmission Line Impacts

Construction of a 345-kv transmission line could adversely affect cultural resources. Tower construction, the building or improvement of access roads, and the construction of associated electrical substations disturb the ground surface and, therefore, could destroy surficial and buried cultural resources. The improved access associated with the transmission line construction could also indirectly adversely affect cultural resources that had previously been protected by their isolation and inaccessibility.

A cultural resource literature and site file search has been conducted to provide an assessment of the cultural resource record for some 1010 km (631 miles) of designated transmission line corridor segments for the proposed Rifle to San Juan project. The assessment evaluated the alternative segments according to five variables: expected site density, number of known sites, amount of previous archaeological inventory, site type, and the presence or absence of sites listed on the NRHP. The study area was divided into four sections, for comparison purposes, and the segments within each section were evaluated.

Known site data were combined with the information for the segments to derive cultural resource sensitivity rankings for each of the 60 corridor segments presently under consideration. The judgment of several professionals concerning the potential for cultural resource patterns along the various routes was sought. Three rankings, high, medium, and low, were delineated to reflect projected relative cultural resource significance for each of the segments being studied. Overall, of the total of 1010 km (631 miles) of segments, 362 km (226.3 miles, 36 percent) were classified as having high sensitivity, 554 km (346.2 miles, 55 percent) as medium, and 97 km (58.5 miles 9 percent) as low.

Nineteen of the corridor segments contain known historical or archaeological sites or trails based on inventories compiled by the Colorado and New Mexico SHPOS.

Segments 3b, 3e, 4, 12, and 31f contain state-inventoried sites. These sites include:

Segment 3b - Blue Flame Mine;
Segment 3e - Anvil Point Experimental Station
Segment 4 - Currier Homestead Cabin, Hauzhurst Homestead Cabin and the Sunnyside Ditch;
Segment 12 - Christmas Rock Shelter
Segment 31f- Fort Lewis No. 2 site, San Juan Branch Agricultural Experiment Station.

5.8.2 Substation Impacts

New substation construction, such as that at Long Hollow, would be expected to have greater potential for impacts than expansion at existing sites due to prior clearances during substation construction and reduced need for new access. The Long Hollow Substation occupies an area classified as having a low-to-medium site sensitivity.

With regard to existing substations, the Grand Junction Substation occurs in an area of low site sensitivity. The Durango and Montrose Substations occur in high sensitivity areas. Significant cultural resource impacts at the existing substations are not likely since much of the affected area has been previously disturbed.

5.8.3 Mitigation

Known historic and archaeological resources listed or eligible for listing on the NRHP would be avoided if possible. A cultural resource survey would be completed for the transmission line ROW access roads and new and expanded substations. If sites listed or eligible for listing on the NRHP are discovered, no construction would be initiated until the procedures prescribed by the ACHP, 36 CFR 800.4 - 800.6, have been carried out. If construction should be comtemplated outside the boundaries of the area surveyed, the additional area would be surveyed at that time. If any sites are found during construction, work would be stopped until authorities could be notified and an archaeologist could proceed to the site to make an appropriate assessment.

5.8.4 Alternative Corridor Impact Comparison

The alternative corridors are classified into high, medium, and low site sensitivity rankings and reflect the expected frequency

of cultural resources within the proposed corridors. The criteria for classifying the various alternatives into the high, medium and low ranks vary somewhat across the project area because the alternative corridors cross a variety of major topographic features, and cross cultural boundaries of prehistoric groups. In general, the southern portion of the project area is characterized by high site density and the northern portion has a lower site density. To apply strict site density estimates in the definition of sensitivity ranking across the entire project area would result in masking localized variability in site densities. Consequently, different site density criteria were used in defining the various ranks in the northern and the southern portions of the project area. An estimated site density of two to five sites per square km (six to twelve sites per square mile) may be considered a high sensitivity zone in the northern portion, yet the same site density may be considered characteristic of the medium sensitivity rank in the southern portion. The specific sensitivity rankings for all the segments is presented in the Cultural Resource Overview prepared by Nickens and Associates, Montrose, Colorado (Nickens and Associates 1982).

Rifle Substation to Grand Junction Substation

The preferred corridor alternative (H) crosses 4.8 km (3.0 miles) of high cultural resource sensitivity area. The preferred alternative crosses 74.4 km (46.5 miles) of medium sensitivity which mostly occur in segments 3c and 3i; and 10.4 km (6.5 miles) of low sensitivity areas. The other alternatives cross equal or lesser amounts of medium and low sensitivity areas.

Alternatives D, E, F and G cross 11.2 km (7.0 miles) of high site density areas in segments 4 and 5a. All the alternatives except C cross the Dominquez-Escalante Trail. Alternatives D, E, F and G have the highest incidence of state inventory sites which occur in segment 4. The alternatives for this line section each have similar impact potentials.

Grand Junction Substation to Montrose Substation

The three alternatives share a common corridor from the Grand Junction Substation to the Gunnison River crossing, and traverse 40.6 km (25.4 miles) with a low sensitivity ranking. After the corridor crosses the Gunnison River, the potential for higher site densities increases, and alternatives A, C and the preferred corridor (B) cross 39.7, 56.8, and 41.8 km (24.8, 35.5 and 26.1 miles) of high sensitivity area, respectively. One existing state inventory site is located in segment 12 which is common to all alternatives. Alternative C has the highest potential to impact cultural resources in this section.

Montrose Substation to Norwood Substation Site

The preferred alternative (A) crosses 14.4 km (9.0 miles) of high sensitivity ranking compared to 16.0 km (10 miles) for alternative B, 66.1 km (41.3 miles) for C, 85.0 km (53.1 miles) for D, and 22.1 km (13.8 miles) for E. Alternative C has a high rating because segment 22 within the alternative has been the subject of considerable previous archaeological surveys which have indicated a high site density. Alternative D has a high ranking because of an expected site density of approximately 4 sites per square kilometer (10 sites per square mile) in segment 24 and the occurrence of 130 known cultural resource sites.

The high sensitivity ratings for Alternatives B, E and the preferred alternative (A) are due in part to the crossing of the San Miguel River in segment 21 which has a potential for high site density. The remaining portions of these alternatives have medium sensitivity rankings. Alternatives C and D have low sensitivities for the protion that crosses the Uncompahgre National Forest (Segment 18) which is considered to have a low site density.

Alternatives C, D and the preferred corridor (A) each cross the Dominguez-Escalante Trail once and alternatives B and E twice. Alternatives C and D clearly have the highest impact potential in this section while alternative B and the preferred have the lowest.

Norwood Substation Site to Montezuma-La Plata County Line

Alternatives A and the preferred corridor traverse moderately high National Forest lands between the San Miguel River Valley and the Dolores River Valley for 58.2 km (36.4 miles) in segments 29a, 29b and 29c. Site sensitivity along the proposed corridor in this area is in the medium category, with between two and five sites per square kilometer (five and twelve sites per square mile). There are a few areas of high site sensitivity in segment 29b, however. A length of 3.2 km (2.0 miles) near Willow Springs has a high site density, as does a 1.6 km (1.0 mile) portion at McPhee Park.

Progressing southward the alternative corridors cross the Dolores River and enter the homeland of the Pueblo-building Anasazi. Numerous sites have been recorded near the Dolores River canyon and in Lost Canyon, the major tributary; alternatives in this area have been ranked high in sensitivity. Site densities may range between five and eight sites per square kilometer (12 and 20 sites per square mile) in this area. Portions of Alternative A and the preferred (b) which are distant from the Dolores Canyon

are considered to have a medium sensitivity. All the alternatives traverse a medium sensitivity area on the uplands in segment 30e.

The Dominquez-Escalante Trail would be crossed by Alternative A in segment 29d and if a 345-kv tap lien were required. The Trail is crossed by the preferred corridor in one location. However, there is no evidence of the trail on the ground, thus no impacts to it would occur.

Alternative C has the lowest impact potential in this section. However, if the 345-kv tap line were constructed, Alternative C would have the highest impact potential. It would cross more areas with a high and medium sensitivity than the preferred alternative (B).

<u>Montezuma-La Plata County Line to Long Hollow Substation</u>
The five alternatives are mostly located on the uplands near Hesperus, with a medium potential for sites. The preferred alternative (C) crosses rugged terrain for 14.9 km (9.3 miles) with a predicted site density of approximately 2 sites per square kilometer (6 sites per square mile) and low sensitivity ranking. Alternative E traverses 4.0 km (2.5 miles) with a low sensitivity ranking in the same vicinity. Alternative corridors A, B and E traverse 2 state inventory sites in segment 31f. Alternative D crosses the Dominquez-Escalante Trail.

<u>Long Hollow Substation to San Juan Generating Station</u>
The alternative corridors decrease in elevation and extend onto broad, relatively level mesas as they extend southward from the Long Hollow substation. The corridor segments generally follow the La Plata River. This country has numerous archaeological resources; Segments 31c, 33, 34, 35a, 35c and 36a are located in this area, and have high sensitivity rankings.

Near the southern terminus of the project area, the alternative corridors extend westward from the La Plata River, and enter the low, nearly flat badlands surrounding the San Juan Generating Station. Sites are present in these badlands, but are substantially fewer in number than in the more hospitable lands near the La Plata River and to the north. Consequently, the eastern portions of segments 35b and 36b, near the river, are placed into the high sensitivity ranking, and the western portions, in the badlands, are placed into the medium sensitivity ranking.

Alternatives A, C, D and the preferred alternative (B) cross 56.2, 62.4, 62.4, and 65.4 km (35.1, 39.0, 39.0, and 40.9 miles)

of area with a sensitivity ranking, respectively. The preferred corridor crosses more highly sensitive areas; however, Alternative D, due to its extra length, crosses more area with a medium sensitivity ranking and, therefore, has the highest impact potential in this section.

Long Hollow to Durango 115-kv Corridor
A considerable amount of archaeological survey has been completed in Ridges Basin, revealing high site densities. Segment 39 is close enough to these surveyed areas to warrant classification into the high sensitivity class.

In summary, the probability for impact to cultural resources is higher for those corridor segments which traverse high sensitivity areas. The proposed corridor crosses 144 km (90 miles) of high sensitivity areas; this represents 33 percent of the total route. Nearly 209 km (131 miles) of the proposed corridor crosses areas classified as medium in sensitivity. Sixty-six km (41 miles) of the corridor would crosses low sensitivity areas.

In comparison to the original double-circuit 345-kv proposal corridor, the new corridor would affect fewer state inventory and NRHP sites and crosses the Dominguez-Escalante Trail fewer times.

5.8.5 Secondary Impacts
Improved access could have a detrimental effect on the known and undiscovered cultural resources outside the ROW which would be vulnerable to human disturbance and vandalism. Although known cultural resources would be avoided during ROW determination if possible, the proximity of the project to cultural resources outside the ROW would not be known until the centerline is located. Until that time, specific sites that may be vulnerable to vandalism cannot be identified. Coordination with the Colorado or New Mexico SHPO would occur if vandalism is determined to be likely at any time during design or construction of the proposed project.

5.8.6 Cumulative Effects
The proposed project is not expected to add to the cumulative destruction of significant cultural resource sites considering that the provisions of the National Historic Preservation Act of 1966 would be followed.

5.8.7 Adverse Impacts Which Cannot Be Avoided
Although the preferred mitigation for all cultural resources encountered within the corridor segments is avoidance, this may not

be possible at all locations. If avoidance is not possible, procedures prescribed by the ACHP at 36 CFR 800.4-800.6 would be carried out. This disturbance would represent an unavoidable impact.

The primary unavoidable adverse impact would result from increased vandalism to sites made more accessible by access roads. Improved access may attract individuals seeking to collect or disturb artifacts at these sites. Limiting the use of access roads would lessen the impact but not completely eliminate it.

State inventory and NRHP sites are of primary concern. Twelve state sites could occur along several possible corridor combinations, but at least one combination could avoid passing near any state sites. At least one corridor combination could involve as many as three NRHP sites; most combinations involve no NRHP sites.

The Dominguez-Escalante Trail is crossed at various points along all route combinations. This is unavoidable since the trail crisscrosses the region several times. Depending on the route combinations, the trail could be crossed between 3 and 10 times. However, little or no evidence of the trail exists on the ground.

5.9 Impacts on Land Use

5.9.1 General Transmission Line Impacts

Transportation Facilities

Airports, landing strips and navigational aids within the study area were identified and avoided in compliance with the Federal Aviation Administration (FAA) regulations. A potential safety hazard for low-flying aircraft could be caused by the proposed transmission line at canyon crossings.

Energy and Mineral Resources

Surface mining of fossil fuels and mineral resources could be affected by the proposed transmission line but the existence of the line should not impede underground extraction. Many of the alternative segments cross some type of mineral resource area. Coal leasing areas are crossed by segments 3e, 3i, 3g, 4, 5a, 24, 32a, 32b, 32c, 31a, 31b, 31d, 31e, 31f, 31g, 31h, and 39. Segments 3b, 3c, 3d, 3e, 3h, 3i, 4, 31c, 35a, and 36a cross gas field sections while segments 34 and 36a cross sections of oil fields.

Commercial Timber

Timber located within FS designated commercial forest would be removed from production due to ROW considerations. About 7 ha (18 acres) of commercial forest would be permanently lost for each 1.6 km (1.0 mile) traversed by the proposed line. Corridor segments that cross commercial forest include 15d, 17b, 18, 19a, 20a, 21, 22c, 25b, 26, 29b, 29c, 29d, 30a, 30b, 30e, 31a, and 32a.

Agriculture

During the life of the project, agriculture and grazing could continue within the transmission line ROW and therefore, would not be significantly affected. A maximum of 0.025 ha per km (0.09 acre per mile) would be occupied by towers for the life of the project. In segments 14c and, where double-circuit towers would be necessary and where some irrigated cropland occurs, 0.04 ha/km (0.16 acre/mile) would be occupied.

The majority of the segments cross agricultural land; however, only three segments cross prime farmlands. These segments include 3f, 12 and 14a. Over half the segments cross irrigated cropland, but most cross less than 8 km (5 miles). Corridor segments crossing more than 8 km (5 miles) include segment 1a, crossing 8 km (5 miles) and segment 4, crossing 24 km (14 miles). The greatest potential to impact agricultural areas would be from a line constructed in segment 28.

The degree of impact on farming operations cannot be quantified precisely and may vary greatly from landowner to landowner depending upon customary farming practices, machinery sizes and other factors. In general, the ROW and the area under the towers can continue to be cultivated. However, some landowners may not find it practical to farm under and in close proximity to tower structures; consequently, the land under the towers would be lost from production. In irrigated agricultural lands, the transmission line may limit the area that can be converted to automatic sprinkling systems. The placement of towers in existing gravity-fed irrigation systems would not significantly affect current irrigation practices.

REA has determined that no practicable alternative exists to crossing prime farmland and converting 0.2 ha (0.6 acres) to other uses for the life of the project, that the adverse effects or use on prime farmlands has been/would be minimized to the extent practical, and that the national interests of rural electrification achieved by this project outweigh the environmental

benefits derived from protecting the prime farmlands from such use.

5.9.2 Substation Impacts

The existing substation sites as well as the proposed new substation site occur on private land. New construction, including expansion of existing substations, would not be located in cropland areas. Construction, as presently planned, would remove approximately 12 ha (30 acres) of land from potential grazing. No important range land would be lost. Significant adverse impacts to existing or future land use are not expected as a result of the proposed project.

5.9.3 Mitigation

The proposed transmission facilities would be constructed in compliance with all applicable federal regulations to minimize interference with any existing transportation systems including highways, railroads, airports, and navigable airspace. FAA officials would be provided with design and centerline information to assure minimal impact to navigation. Hazard markers would be placed on lines where required.

An exact determination as to the location of energy or mineral resource lands would be made when the transmission line's ROW is identified within the larger corridor. During the ROW approval process, a resolution to any energy lease-transmission line conflicts would be sought through consultations with all affected parties.

Land management agencies would be reimbursed for any commercial timber removed or damage to young growth because of ROW clearing activities. Timber smaller than commercial size would be paid for at current appraised value.

In order to minimize the disturbance to agricultural lands, the proposed centerline would be located along property or section lines, where practical. This should minimize or eliminate the interference with farming activities during the construction and operating stages of the project. All fences cut or damaged during construction would be repaired, and gates would be installed in existing fences to prevent livestock from escaping.

In areas where the line must cross prime, important, or irrigated farmlands, the towers would be carefully located to minimize disturbances. Access roads and staging areas would, where possible, be located away from farmlands.

5.9.4 Alternative Corridor Impact Comparison

As described in Appendix B, prime farmland, irrigated farmland and commercial forest would have a high potential to be impacted by the proposal. Nonirrigated cropland would have a moderate potential to be impacted. The amount of these land resources plus the number of highway crossings, and the amount of potential energy resources crossed by the alternatives are compared for the respective sections.

Rifle Substation to Grand Junction Substation

The preferred corridor (Alternative H) and Alternative A cross one major highway each and Alternatives B, C, D, E, F and G cross three major highways. Alternative C has the greatest potential to conflict with transportation facilities since it would cross Interstate 70 twice.

Alternatives D, E, F and G cross 8 km (5 miles) of gas reserves in segment 4 compared to 4.2 km (2.6 miles) for the preferred alternative. Alternatives A, B and C cross 2.6, 4.3, and 5.1 km (1.6, 2.7 and 3.2 miles), respectively. None of the alternatives in this section cross commercial forest.

Alternatives A and B cross 4.3 km (2.7 miles) of prime farmland. The preferred corridor and alternative A cross 2.1 and 4.0 km (1.3 and 2.5 miles) of irrigated cropland, respectively, whereas alternatives B, C, D, E, F and G cross from 10.7 to 30.9 km (6.7 to 19.3 miles). Alternatives F and G do not cross any nonirrigated cropland: the preferred corridor (H) crosses 3.7 km (2.3 miles) and the other alternatives 7.2 to 15.7 km (4.5 to 9.8 miles). Therefore, the preferred corridor would have the least potential to impact agricultural lands in this section.

Grand Junction Substation to Montrose Substation

There are no commercial forest or energy or mineral potentials in this line section. Segments 5b and 12 are common to all three alternatives and cross U.S. Highway 50 south of Grand Junction, 5.6 km (3.5 miles) of prime farmland, 7.7 km (4.8 miles) of irrigated cropland and no nonirrigated cropland. Therefore, minimal land use impacts are expected within these segments.

South of segment 12, the preferred alternative (B) crosses 1.8 km (1.8 miles) of prime farmland, 4.5 km (2.8 miles) of irrigated cropland, no nonirrigated croplands and one major highway. Alternative A crosses 1.8 km (1.1 miles) of prime farmland, 5.6 km (3.5 miles) of irrigated cropland, 1.9 km (1.2 miles) of nonirrigated cropland, and one major highway.

Alternative C crosses 4.5 km (2.8 miles) of prime farmland, 4.5 km (2.8 miles) of irrigated cropland, 6.7 km (4.2 miles) of non-irrigated cropland, and no major highways. Alternative A crosses the most prime farmland, and a substanital amount of irrigated cropland and, therefore, would have the greatest potential to impact agricultural lands in this line section. The potential to impact other land uses would be similar for all alternatives.

Montrose Substation to Norwood Substation Site

Except for commercial forest resources, the impacts to land use within this section would be minimal due to the lack of resources. The preferred alternative (A) and alternatives C and D each cross two major highways and alternatives B and E one highway. Alternative D is the only corridor crossing any known energy or mineral resources, crossing 4.0 km (2.5 miles) of known coal reserves in segment 24. No prime farmlands are traversed, and alternative C and D are the only corridors that cross 3.2 km (2.0 miles) or more of irrigated cropland. Alternatives B, E and the preferred corridor cross only 2.9 km (1.8 miles) of nonirrigated cropland in segment 21 and alternative D crosses 1.6 km (1.0 mile) of nonirrigated cropland.

Commercial forest resources are abundant within the Uncompahgre National Forest. The preferred alternative (A) traverses 13.6 km (8.5 miles) of commercial forest: alternative B, 4.8 km (3.0 miles); alternative C, 24.5 km (17.8 miles); alternative D, 22.9 km (14.3 miles): and alternative E, 3.2 (2.0 miles). Because alternative C would cross the most commercial forest and would be the only alternative which traverses irrigated cropland; therefore, alternative C would have the greatest potential to impact land use in this section.

Norwood Substation Site to Montezuma-La Plata County Line

There were no prime farmlands or potential energy or mineral resources identified in this section. Alternative A would cross one major highway, 24 km (15.1 miles) of commercial forest, 7.4 km (4.6 miles) of irrigated cropland and no nonirrigated cropland. The preferred corridor (B) would cross one major highway, 33.8 km (12.1 miles) commercial forest, 6.5 km (4.1 miles) irrigated cropland and 1.1 km (0.7 mile) nonirrigated cropland. Alternative C would cross one major highway, 32 km (20.2 miles) commercial forest, 1.6 km (1.0 mile) irrigated cropland and no nonirrigated cropland.

If a 345-kv tap line were constructed to Lost Canyon, the tap associated with the preferred alternative (B) would cross one major highway, 1.6 km (1.0 miles) of commercial forest, 1.6 km

(1.0 mile) of irrigated cropland. The tap that would be associated with Alternative C would cross one major highway, 17.3 km (10.8 miles) of commercial forest, 1.6 km (1.0 mile) of irrigated cropland and no nonirrigated cropland. The preferred alternative with the tap would have the greatest agricultural impact in this section, although overall, Alternative C would have the greatest land use impacts.

Montezuma-La Plata County Line to Long Hollow Substation

No prime farmlands are traversed in this section, but significant crossings of commercial forest and irrigated cropland occur within some alternatives. The preferred alternative (C) crosses two major highways, 12.0 km (7.5 miles) of known coal resource, 9.6 km (6.0 miles) of commercial forest, 5.1 km (3.2 miles) of irrigated cropland, and 2.7 km (1.7 miles) of nonirrigated cropland. Alternative A crosses one major highway, 28.3 km (17.7 miles) of known coal resource, 2.1 km (1.3 miles) of commercial forest, 23.7 km (14.8 miles) of irrigated cropland and 2.1 km (1.3 miles) of nonirrigated cropland. Alternative B crosses two major highways, 26.2 km (16.4 miles) of known coal resource, 2.1 km (1.3 miles) of commercial forest, 13.4 km (8.4 miles) of irrigated cropland and no nonirrigated cropland. Alternative D crosses two major highways, 9.9 km (6.2 miles) of known coal resource, 9.6 km (6.0 miles) of commercial forest and 3.4 km (2.1 miles) irrigated cropland and no nonirrigated cropland. Alternative E crosses two major highways, 19.5 km (12.2 miles) of known coal resource, 9.6 km (6.0 miles) of commercial forest, 9.0 km (5.6 miles) of irrigated cropland and no nonirrigated cropland.

Alternative D would have the least potential to impact land use in this section. Alternatives A and B traverse less commercial forest lands than the preferred corridor, but 18.6 and 8.2 km (11.6 and 5.2 miles) more, respectively, of irrigated cropland.

Long Hollow Substation to San Juan Generating Station

There are no prime farmlands or commercial forest crossed in this section. Alternatives A, B, and C traverse 5.3 km (3.3 miles) or less of irrigated cropland and less than 6.4 km (4.0 miles) of nonirrigated cropland. The preferred alternative (B) traverses the least irrigated cropland, 2.6 km (1.6 miles). Alternative C does not traverse any nonirrigated cropland. Alternative D crosses one major highway, while the other alternatives cross two highways and more irrigated cropland. Alternative D is the only alternative that traverses known coal reserves 19.2 km (12 miles), but only a minimal area of oil and gas field is crossed. Alternative A does not cross any oil fields but crosses more gas fields

than the preferred corridor. Alternative C does not cross any gas fields but crosses more oil fields than the preferred corridor. Alternative D would have the greatest potential to impact land use in this section.

Long Hollow to Durango 115-kv Corridor

The proposed corridor crosses a coal leasing area and about 5.8 km (3.6 miles) of irrigated cropland.

In summary, land use impacts under the current proposal would be very similar to those for the original double-circuit 345-kv proposal. Under the revised proposal, the proposed corridor connects Rifle and Delta and generally follows the Grand Valley passing near Palisade and Grand Junction.

The revised corridor for the project potentially affects fewer airports than the original corridor in the northern section. Fewer major highways are crossed as well, indicating a slight reduction in visibility of the line.

Potential conflicts with coal leasing areas with the revised proposal are essentially the same as the original proposal. The revised proposal has fewer potential conflicts with oil fields but greater potential conflicts with gas fields than the original proposal.

The participants' proposed corridor for the 345-kv line traverses approximately 7 km (5 miles) of prime farmland, 31 km (20 miles) of irrigated cropland, and 12 km (8 miles) of nonirrigated cropland. In comparison to the original project, the revised proposal has less potential to impact prime farmland and irrigated cropland, but has greater potential conflicts with nonirrigated cropland.

5.9.5 Adverse Impacts Which Cannot Be Avoided

Those areas removed from agricultural production by tower footing, substation, and access road installations would represent an unavoidable land use impact. The proposed corridor would pass through about 8 km (5 miles) of prime farmland. If the selected route would pass through agricultural lands, the impact could be minimized on a site-specific basis during location of the centerline within the corridor. About 321 ha (793 acres) of commercial forest would be removed from production in the proposed corridor.

5.10 Impacts on Human Resources

5.10.1 General Transmission Line Impacts

The proposal would impact human resources, ranging from high impacts to high density populated areas (areas with residential and commercial parcels less than 80 acres each) and recreation areas, to low impacts on low density populated areas and public use areas including BLM, FS and state lands.

During the corridor selection process, population centers were avoided where possible. However, several alternative corridor segments cross high density areas. Segments 3d, 3e and 28 are the only segments crossing more than 16 km (10 miles) of high density area. Segments 4, 30c, 32b and 35b cross high density areas from 8 to 16 km (5 to 10 miles) in length, and segments 12, 14c, 15d, 15e, 22c, 30d, 34, 35a, and 35c cross 3.2 to 8 km (2 to 5 miles) of high density areas. The transmission line would be sited to avoid private residences as much as practical. However, in high density areas, it is possible that the line would be visible from some residences. No residences would be permitted within the ROW.

Segments 31c, 33, 34, 35a, 36a, and 36b cross the Southern Ute Indian Reservation which has been designated as a low density populated area.

Segments that cross unsettled BLM lands include 1b, 1c, 1d, 1e, 3b, 3c, 3d, 3e, 3f, 3j, 3h, 3i, 3g, 4, 5a, 5b, 12, 14a, 14d, 14e, 15c, 15d, 15e, 17a, 17b, 19a, 21, 22c, 24, 25a, 25b, 26, 28, 32c, 35a, 35b, 35c, 36a, and 36b.

Twenty-three corridor segments cross portions of National Forests as follows:

White River - 1d, 1e
Grand Mesa - 1d, 1e, 4
Uncompahgre - 15e, 17b, 18, 19a, 20a, 21, 22c, 24, 25b
San Juan - 26, 29b, 29c, 29d, 30a, 30b, 30e, 31a, 32a, and 32b

Four corridor segments cross state-owned lands and include segments 12, 28, 31f, and 32b.

Construction and operation of the proposed project should have minimal permanent effect on recreational resources. The impact to recreational resources from the proposed project would be primarily visual. During the construction phase increased noise and disturbances may temporarily discourage use of some recreational

areas. Access roads used for construction could create some new access to areas for hunters, fishermen, and off road vehicle (ORV) users, thereby, increasing recreational opportunities. The Dolores River has been proposed for listing in the National Wild and Scenic River System. Alternative segment 26 would cross a section of the river proposed for scenic designation. Wilderness areas were avoided during the constraint mapping process, and would not be affected by the project.

5.10.2 Substations

None of the substations are located in high human use impact areas; i.e., high density residential or recreation areas. Therefore, substation impacts on human resources would be minimal. No substations would be located on BLM, FS, state or tribal lands. All are located in low density population areas with minimal impact potential.

5.10.3 Mitigation

Consultation with local planning agencies on a continuing basis in establishing the line route within the proposed corridor would minimize the impact to high density areas. Any easements required on private land would be based on negotiations with landowners. Colorado-Ute is coordinating its planning acitivities with the Southern Ute tribal officials to insure that any right-of-way is compatible with their land use plans. Appropriate permits would be obtained prior to final centerline location and construction.

To minimize the potential for impacts to recreational resources, the project participants would coordinate with the appropriate administering agency during location of ROW centerline and tower locations. Efforts would be made to locate the facilities in the least obtrusive and most environmentally compatible manner.

5.10.4 Alternative Corridor Impact Comparison

The comparisons in this section are based on the impact evaluation system described in Section 3.7 and Appendix B, the presence or absence of recreation facilities, and the amount of unsettled public lands traversed.

Rifle Substation to Grand Junction Substation

Alternatives B and C have the greatest potential to impact human resources due to the crossing of high density areas near the Colorado River, segments 3d and 3e, respectively. Alternative B would pass through Battlement Mesa. Alternative C would pass near the towns of Parachute and DeBeque.

Alternatives D, E, F and G traverse 12.8 km (8 miles) of high density area and the Plateau Creek State Wildlife Area in segment 4 and thus have the next highest potential to impact human resources. Alternative A and the preferred corridor (alternative H) have the lowest impact potential since only 9.3 and 6.7 km (5.8 and 4.3 miles) of high density area are traversed, respectively. The preferred alternative traverses the most unsettled area with a low impact potential, which contributes to the lower overall impact of the preferred alternative.

<u>Grand Junction Substation to Montrose Substation</u>
Each of the alternatives in this section traverses the Escalante State Wildlife Area on the Gunnison River and crosses 4.8 km (3.0 miles) of high density human component area, and 43.5 km (27.2 miles) of unsettled public lands. South of segment 12, the preferred alternative (B) and alternative C traverse the most high density area and, therefore, have the greatest impact potential. Alternative A has the lowest potential to impact human resources.

<u>Montrose Substation to Norwood Substation Site</u>
Alternatives B, C and E traverse 11.2, 10.9 and 10.4 km (7.0, 6.8 and 6.5 miles) respectively, of high density human conponent areas compared to 5.3 km (3.3 miles) for the preferred alternative (A) and alternative D. Alternative B is the shortest corridor, but because it traverses more high impact area, has a greater impact potential than the preferred alternative.

<u>Norwood Substation Site to Montezuma-La Plata County Line</u>
Alternative A would cross 16.5 km (10.3 miles) of high density human component area and the Sumit Reservoir State Fishing Area. The preferred corridor (B) would cross 6.9 km (4.3 miles) high density human component area and 34.9 km (21.8 miles) of FS land, and the Joe Moore Reservoir State Fishing Area 1.0 km (.6 mile). Alternative C would cross no high density human component area and 41.0 km (25.6 miles) of FS land. Alternative A would have the greatest and alternative C the least potential to impact the human component.

If a 345-kv tap line were constructed to Lost Canyon Substation, the alternatives B and C would traverse 1.6 km (1.0 mile) of high density human component area. Alternatives B and C would cross 1.6 and 17.3 km (1.0 and 10.8 miles) of nonsettled FS land, respectively. Thus, minimal impacts would occur to human resources into Lost Canyon.

Montezuma-La Plata County Line to Long Hollow Substation
None of the alternatives in this section cross recreation areas. Alternative D has the greatest impact potential since 13.0 km (8.1 miles) of high density human component area is traversed in segment 32b. None of the other alternatives traverse any high density human component areas. Alternatives A, B and C (preferred) traverse the most low density private areas. The preferred corridor traverses about equal amounts of low density private lands and nonsettled public lands.

Long Hollow Substation to San Juan Generating Station
No recreation areas are traversed in this section. Most of the lands crossed are nonsettled public lands. Alternative A has the greatest potential to impact human resources since it traverses 13.6 km (8.5 miles) of high density human component area. Alternative D and the preferred (B) cross less high density human component areas, and therefore, have lower impact potentials.

Long Hollow Substation to Durango 115-kv Corridor
About 3.2 km (2.0 miles) of high density human component area, 7.0 km (4.4 miles) of low density and 3.5 km (2.2 miles) of nonsettled area are traversed.

In summary, the original double-circuit 345-kv line proposal paralleled Western's 230-kv line to Paonia and crossed the Grand Mesa National Forest. In continuing to Delta, it also would have passed near the communities of Paonia, Lazear, Orchard Mesa, and Delta. Therefore, impacts on communities under the revised proposal, are less for the northern section of the project. In fact, from Grand Junction to Delta no communities are in the vicinity of the proposed corridor.

In the central section, the corridors for the original proposal and the revised are essentially the same, except the crossing of the Uncompahgre National Forest is somewhat modified.

The southern section of the revised proposal traverses about the same distance of San Juan National Forest. The proposed Long Hollow Substation to San Juan proposed corridor does not pass near the community of Redmesa as the original corridor did. The revised proposal has less effect on all land ownership categories except public lands administered by the BLM, the revised proposed corridor traverses more BLM administered public land.

The participants' preferred corridor crosses 3 km (2 miles) of state owned lands, 155 km (95 miles) of BLM land, and 80 km (50 miles) of FS land, crossing approximately 35 km (22 miles) of the Uncompahgre National Forest, and 45 km (28 miles) of the San Juan

National Forest. The proposed corridor would not impact any existing or proposed wild and scenic rivers.

5.10.5 Secondary Impacts

None.

5.10.6 Cumulative Impacts

None.

5.10.7 Unavoidable Adverse Impacts

Based on the mitigation described above, no unavoidable adverse impacts are expected.

5.11 Socioeconomic Impacts

5.11.1 Direct Impacts

The principal short-term economic impacts of the proposed line would result from payments to landowners for land and easement rights, payments for materials obtained locally, and temporary use of some local labor for construction. There would be some additional income to local merchants from the sale of goods and services to both local and imported labor used for this project. The project would probably be constructed in three sections, each requiring an estimated 120 to 200 construction workers. Contractor purchases of major construction supplies would be from outside the project area. The work force would be split into smaller crews along different sections of the line. The entire construction period would be approximately 24 to 30 months during which time no more than 50 workers are expected to be present at any one place.

Payments for land and easement acquisition would benefit landowners. The states of Colorado and New Mexico would receive sales tax revenue from goods and services purchased by construction workers and any material purchased by the contractors. Colorado-Ute and PSC would also pay county taxes on the transmission lines and associated substation facilities. Annual property tax revenue would vary from county to county, depending on the tax rate and the number and length of proposed facilities within each county.

5.11.2 Secondary Impacts

Estimated county revenues from taxes assessed or levied in proportion to Colorado-Ute's and PSC's beneficial interest in the project are presented in Table 5-1. However, since the actual cost of the line would not be known until completion and, since allocations of tax revenues among the counties have not yet been

TABLE 5-1

Estimated County Tax Revenues*
Rifle-San Juan 345 kv Transmission Line and Associated Facilities

County	Valuation Percent	Average Mill Levy	Facility	Estimated Cost of Facility (1982 Dollars)**	Estimated Tax Revenues
Garfield	18.7410	77.161	Rifle 345-kv Substation	$ 1,080,000	$ 16,000
			28 Miles of Line	5,783,750	84,000
				County Total	$100,000
Mesa	18.5993	65.087	Grand Junction 345/230-kv Substation	$ 2,460,000	$ 30,000
			48 Miles of Line	9,254,000	112,000
				County Total	$142,000
Delta	18.6022	74.435	15 Miles of Line	$ 2,478,750	$ 34,000
Montrose	19.6746	76.686	Montrose 345/115-kv Substation	$ 5,290,000	$ 80,000
			44 Miles of Line	7,271,000	110,000
				County Total	$190,000
Ouray	18.6086	133.429	4 Miles of Line	$ 661,000	$ 16,000
San Miguel	18.6052	67.866	24 Miles of Line	3,966,000	50,000
Dolores	18.6005	74.433	19 Miles of Line	$ 3,139,750	$ 43,000
Montezuma	18.7373	83.254	30 Miles of Line	$ 4,957,500	$ 77,000
			Lost Canyon 345/115-kv Substation	2,210,000	34,000
					$111,000
La Plata	18.6744	63.962	Long Hollow 345/115-kv Substation	$ 6,110,000	$ 73,000
			32 Miles of Line	5,288,000	63,000
			Long Hollow-Durango 115-kv Tap	1,000,000	12,000
			Durango 115-kv Substation Expansion	100,000	1,000
				County Total	$149,000

*Based on 1982 Tax Information

**Based on 1982 Dollars, without interest during Construction for Colorado-Ute and PSC.

established by the State of Colorado, the amounts of such revenues estimated for each county are subject to change.

REA has determined that the construction and operation of the transmission line should have no impact on civil rights, due to the short-term construction time frame and its minor impact on housing and employment and low minority populations in the area (Table 5-2). Furthermore, REA requires borrowers and their contractors and subcontractors (for contracts exceeding $10,000) to be in compliance with REA Bulletin 20-15:320-15 Equal Employment Opportunities in Construction Financed with REA Loans and Bulletin 20-19:320-19 Nondiscrimination Among Beneficiaries of REA Programs.

The proposed project would also create indirect, long-term economic effects by providing a capability to supply increased power for area industrial, commercial, and residential needs. The proposed line would contribute to supply added power. The proposed line would contribute to local economic growth by supplying additional electric energy to meet projected requirements of the service area.

5.11.3 Cumulative Impacts

The comparison of the manpower requirements of the proposed Rifle-San Juan Project with those of other projects is discussed in Section 5.14. The relative contribution of this project to the total population impact can be seen from this comparison. The population influx into a region is a primary force behind the social and economic impacts of energy development. Every aspect of impact, especially the demand for housing and public services is directly related to population change.

It is expected that the construction workforce influx would result in a total population influx of 1104 new residents into the affected communities. The total influx associated with the projects listed in Section 5.14 was estimated to be 45,859 persons in 1985. However, since a number of these projects have indefinite schedules the total influx would be much less. It should be recognized that all of these estimates are highly tentative, since they are based on schedules which are subject to considerable change over time, as well as on further extrapolations. Information available is adequate to establish, however, that the Rifle-San Juan transmission line construction would contribute a relatively small part to the total population impact expected in the study area during the next decade.

Table 5-2
MINORITY POPULATION BY COUNTY
1980

County	Spanish Origin No.	Spanish Origin %	Black No.	Black %	Am. Indian, Eskimo, Aleut No.	Am. Indian, Eskimo, Aleut %	Asian, Pacific Islander No.	Asian, Pacific Islander %	Other No.	Other %	Total No.	Total %
Delta	1781	8.4	20	0.1	140	0.7	65	0.3	656	3.1	2662	12.5
Dolores	54	3.3	1	0.1	41	2.5	2	0.1	24	1.4	122	7.4
Garfield	935	4.2	27	0.1	106	0.5	49	0.2	324	1.4	1441	6.4
La Plata	3072	11.2	41	0.1	1122	4.1	56	0.2	1877	6.8	6168	22.5
Mesa	5743	7.0	214	0.3	478	0.6	346	0.4	2402	2.9	9183	11.3
Montezuma	1352	8.2	10	0.1	1651	10.0	46	0.3	584	3.5	3643	22.1
Montrose	2323	9.5	40	0.2	166	0.7	32	0.1	873	3.6	3434	14.1
Ouray	83	4.3	5	0.3	2	0.1	9	0.5	18	0.9	117	6.1
San Juan	121	14.5	-	-	3	0.4	1	0.1	37	4.4	162	19.4
San Miguel	100	3.1	5	0.2	102	3.2	9	0.3	28	0.9	244	7.6
San Juan, N.M.	9551	11.8	321	0.4	26777	33.1	153	0.2	4710	5.8	41412	51.4

Source: U.S. Bureau of the Census, 1980 Census of Population and Housing, Advance Reports, Colorado, New Mexico, 1981.

5.12 Visual Impacts

5.12.1 General Transmission Line Impacts

The presence of the transmission towers, conductors, ROW, and access roads changes the appearance of the existing landscape, and therefore, constitutes a visual impact. The degree of impact is determined by the landscape type and the proximity of the project to populated and traveled areas. The transmission line would cause visual contrast in or near visually sensitive areas such as major travel routes, primary highway crossings, high-quality scenic areas, communities, and recreation areas. The degree of additional contrast would depend on the presence and size of existing lines, existing scenic quality and existing visual absorption capacity.

Scenic quality could be most affected by constructing new lines in undeveloped areas. Areas with high and medium visual absorption capacity and low and medium sensitivity ratings would be least affected. New lines in areas of high visual sensitivity would create the most impact. A further description of these visual impact ratings is found in Appendix B.

5.12.2 Substations

New substations would be located out of view of the public for security and aesthetic reasons. Most existing substations are out of view of major roadways and are not located in high visual impact areas. Therefore, expansion of the substations would not diminish to any extent the visual quality of the general public's view.

Like the existing substations, the new substation at Long Hollow would be located to make it as unobtrusive as possible. However, visual impacts would be greater, at least initially, due to construction in an undeveloped area.

5.12.3 Mitigation

Manmade objects in the natural landscape generally become focal points because of contrasting form, line, color, and texture. The project would be designed to complement its natural surroundings.

The National Forest Landscape Management Utilities Handbook (USDA 1975) and the general construction methods listed in Environmental Criteria for Electric Transmission Systems (USDA, USDI) would be utilized to minimize aesthetic impact. For example, ROW through forest and timber areas would be established with curved undulating boundaries wherever possible. Trees would be topped and pruned and existing small trees and plants will be used to feather the ROW from grass and shrubbery to larger trees.

Centerline selection would avoid skylining the tower structures if possible by staying away from hilltops and ridges. Location and design would take into consideration the topography and vegetation to reduce the visual impact. Nonspecular towers, hardware and conductor would be utilized.

In areas with high visual sensitivity and low visual absorption capability, the participants would consider the use of alternative design structures to minimize visual intrusions.

5.12.4 Alternative Corridor Impact Comparison

Most of the alternative corridor segments are classified as having a high visual impact based on a low VAC and medium or high visual sensitivities. The following discussions summarize the amount of high visual impact areas crossed by the respective alternatives. Estimated mileages and ratings are given in Section 3.7.

Rifle Substation to Grand Junction Substation

The preferred alternative (H) and Alternative A cross about 53 km (33 miles) of area susceptible to a high visual impact or roughly 55 percent of their total lengths. Alternatives B and C cross about 74 km (46 miles) each of high impact area or about 80 percent of their respective lengths, and alternatives D, E, F and G cross over 96 km (60 miles) of area susceptible to high visual impact or roughly 95 percent of their lengths. While the preferred corridor is at least 14 km (9 miles) shorter than Alternatives D, E, F and G, the preferred crosses 51 fewer km (32 fewer miles) of high visual impact areas.

Grand Junction Substation to Montrose Substation

The entire lengths of segments 5b and 12, equal to 60.6 km (37.9 miles), are in high visual impact areas. The preferred alternative (B) south of segment 12 traverses 11.4 km (7.1 miles) of area that would be susceptible to a high visual impact; A, 10.9 km (6.8 miles); and C, 20.5 km (12.8 miles). Alternative C would have the greatest visual impact potential in this section.

Montrose Substation to Norwood Substation Site

Alternative A (preferred) and alternatives B, C, D and E traverse 32.9, 43.4, 53.1, 60.5, and 48.5 km (20.6, 27.1, 33.2, 37.8 and 30.3 miles) of high impact area which corresponds to 48, 64, 67, 60 and 71 percent of the total corridor lengths, respectively. The preferred corridor in this section would thus have a lower visual impact potential than the other alternatives. The preferred corridor also crosses 21.9 km (13.7 miles) of area with a

low visual impact rating, contributing to the lower impact potential.

Norwood Substation Site to Montezuma-La Plata County Line
Alternative A would traverse 55.2 km (34.5 miles) of high, 21.5 km (13.4 miles) of moderate and 11 km (6.8 miles) of low impact areas. The preferred corridor (B) would traverse 50.4 km (31.5 miles) of high, 20.6 km (12.9 miles) of moderate and 14.9 (9.3 miles) of low visual impact areas, while Alternative C would traverse 35.5 km (22.2 miles) of high, 15 km (16.7 miles) of moderate and 17 km (10.5 miles) of low impact area. Alternative C would thus have the least visual impact potential.

If a 345-kv tap line were constructed into Lost Canyon Substation, 4.3 km (2.7 miles) and 0.8 km (0.5 miles) of additional high and moderate visual impact areas, respectively, would be crossed by the tap line associated with Alternative B. A tap line associated with Alternative C would cross 9.1, 2.4, and 10.9 km (5.7, 1.5, and 6.8 miles) of additional high, moderate and low visual impact areas, respectively.

Montezuma-La Plata County Line to Long Hollow Substation
The occurrence of low, moderate and high impact areas for the alternatives in this section are as follows:

Alternative	Impact Kilometers (Miles) Low	Moderate	High
A	- -	12.8 (8.0)	25.3 (15.8)
B	- -	13.1 (8.2)	22.9 (14.3)
C (Preferred)	9.6 (6.0)	5.4 (3.4)	12.8 (8.0)
D	9.6 (6.0)	- -	21.0 (13.1)
E	9.6 (6.0)	8.2 (5.1)	18.9 (11.8)

The preferred alternative (C) is the shortest corridor and has the lowest visual impact potential in this section. Alternatives D and E also cross 9.6 km (6.0 miles) of low impact area, but cross more high impact area than the preferred corridor.

Long Hollow Substation to San Juan Generating Station
The alternatives in this section traverse more area of moderate visual impact than any other alternative in the other line sections. The preferred alternative (B) crosses 60.8 km (38.0 miles) of moderate impact area compared to 48.2 km (31.5 miles) for Alternative A, 54.2 km (33.9 miles) for Alternative C and 48.2 km (30.1 miles) for Alternative D. The preferred corridor also crosses less high impact area than the other alternatives.

Alternative D has the highest impact potential in this section since 39.7 km (24.8 miles) of high impact areas would be traversed.

Long Hollow to Durango 115-kv Corridor

The entire corridor is located in an area with high potential to be impacted visually. Single-pole structures are preferred for this segment. The use of alternative type and/or colored structures would be considered in the design phase to mitigate the visual impact in this section.

In summary, the preferred route crosses approximately 254 km (159 miles) of area with a high potential to be visually impacted. This represents about 59 percent of the total length. Roughly 28 percent of the route traverses areas with a moderate visual impact potential, and 13 percent with a low potential to be visually impacted.

5.12.5 Secondary Impacts

None.

5.12.6 Cumulative Impacts

In areas where the proposed transmission line would parallel existing ROWs the combined visual impact would reflect the additional intrusion into the area. Efforts would be made to minimize the visual impacts through sensitive areas as discussed above.

5.12.7 Adverse Impacts Which Cannot Be Avoided

Parts of the transmission system would pass through areas of high visual sensitivity. The physical presence of the line would create a horizontal and vertical linear intrusion on the existing visual resource, and contrast in color and line from soil and vegetation disturbance.

5.13 Electrical Effects

The electrical effects of the proposed 345-kv transmission line can be characterized as corona effects, electrostatic field effects and electromagnetic field effects. Corona is the electrical breakdown of the air into charged particles caused by the electrical field at the surface of the conductors. Effects of corona are radio and television interference (RI and TVI), audible noise (AN) and oxidant production. Field effects are induced currents and voltages and related effects that occur as a result of electric and magnetic fields at ground level.

5.13.1 Corona Effects

Corona can occur at locations where the field has been enhanced by protusions, such as nicks or water drops. During fair weather, the number of these sources is small and corona is insignificant. However, during wet weather, the number of these sources increases and corona effects are much greater.

5.13.1.1 Radio Interference

The electromagnetic radiation resulting from corona can interfere with radio reception in the amplitude-modulated (AM) radio broadcast range (535-1605 kHz) and to a smaller degree with higher AM frequencies, including the television broadcast band where the antenna is located near a transmission line.

Maximum RI occurs near the outside conductor and decreases as one moves away from the line. Also, as the transmission line conductor diameter increases, corona decreases and hence radio interference also decreases. Due to the weight of the conductor, a practical maximum diameter exists. The conductor diameter selected for this project is about 3.5 cm (1.35 inches). Each phase of the proposed line would have a two-conductor bundle configuration which is capable of transmitting more power than a single larger conductor of the same area. A bundle configuration also reduces corona and RI.

The Rifle-San Juan line would be designed to provide FCC satisfactory service (see Table D-1 in Appendix D) under fair weather conditions for all residences 90 m (300 feet) or greater from the 345-kv line. This design would be based on FCC minimum summertime signal strength requirements for rural areas, a factor considered when the alternative corridors were identified. The criteria and specifications used to calculate the fair weather RI for the proposed project are given in Appendix D.

Some of the alternative corridors parallel the existing 230-kv line. If the two ROWs abut, the combined RI could raise the maximum dB level directly under the outside phase from about 56 db to about 59 db and move the satisfactory reception distance out to about 85 m (280 feet) on either side of the combined ROW, still within the 90 m (300 foot) restriction mentioned earlier. However, the RI could be lower depending on phase relationships of adjacent phases. Therefore, the proposed project should have minimal impact on radio reception.

5.13.1.2 Television Interference

TVI can be generated by sparking between insulators or between unbonded items of hardware and corona. TVI caused by sparking

would be minimized during design and construction. Occurrences of sparking would be corrected by replacing or tightening line hardware. TVI caused by corona may affect picture quality and is dependent upon the signal-to-noise ratio. Since the Rifle-San Juan line would be designed to provide satisfactory AM RI performance, TVI caused by corona is not expected to be a problem.

5.13.1.3 Audible Noise

Audible noise from transmission lines generally has two components--a hum at frequencies of 120 hertz and a random cracking or hissing sound. Based on the predicted levels of audible noise given in Appendix D, it is anticipated that the 345-kv transmission line should cause little or no audible noise annoyance even when adjacent to the ROW of Western's existing 230-kv line.

5.13.1.4 Oxidant Production

Minute quantities of ozone and nitrogen oxides are produced by transmission line corona. The levels produced are too low to be measured at ground levels. For a 345-kv transmission line the maximum one-hour concentration of ozone would be below the National Ambient Air Quality Standard of 0.12 ppm for oxidants. Therefore, the Rifle-San Juan transmission line and associated facilities would not impose a hazard due to ozone production.

5.13.2 Electrostatic Field Effects

A graphic representation of the electric fields at 1 m above ground level are found in Appendix D (Figure D-3). The ground level electric field decreases with an increase in distance from the line. Large metallic objects such as farm equipment, fences and vehicles can conduct and transfer the voltage and current. The proposed 345-kv transmission line would be designed in accordance with the National Electrical Safety Code and REA Bulletin 62-1. Based on calculations, the induced current would not exceed 3.5 milliamps (mA). This current is above the human perception level, but below the 5.0 mA NESC standard. Also, based on further calculations, the maximum induced electrostatic current of the largest anticipated vehicle would not exceed the 5 mA level as recommended by the American National Standards Institute. Adequate grounding of conductive objects near the transmission line would eliminate potential shock hazard. Fences and other stationary objects would be grounded according to recommendations in REA Bulletin 62-4. Paralleling existing transmission lines can increase the maximum electrostatic field, but should not affect the field level at the edge of the ROW. The highest combined electrostatic field would be between the parallel lines.

REA has reviewed the current available literature and has concluded that the proposed 345-kv transmission line would not constitute a biological hazard.

5.13.3 Electromagnetic Field Effects

The currents carried by each of the conductors of the 345-kv and 115-kv transmission line would generate a magnetic field which can create induced voltages in conducting objects beneath the line. The induced voltage is dependent on: line geometry; current magnitude; the distance to the conducting object; the distance that the conducting object is parallel to the transmission line; the grounding of the conducting object; and the shielding of the conducting object. In general, electromagnetic induction effects are only of concern where long conducting objects such as fences parallel the line. The maximum ground level magnetic field produced by the proposed 345-kv line under normal operating conditions is not expected to exceed 0.25 gauss which is less than the earth's magnetic field of 0.6 gauss. The owners of the line would insure that fences are grounded in accordance with National Electric Safety Code standards and REA Bulletin 62-4 recommendations.

Based on the low levels of magnetic fields, the comparability of these fields with other exposure and the lack of evidence for effects from these fields, REA has determined that exposures to proposed transmission lines should cause no adverse effects on biological systems.

5.13.4 Safety Consideration

The ground potential surrounding a transmission tower can increase significantly if lightning strikes the tower. However, ground rods would be provided for low structure footing resistance, thus reducing the area of high potential and reducing the danger.

The electric field present beneath a transmission line can produce a buildup of electrical potential on ungrounded or poorly grounded conductive objects. This condition can result in the discharge of a spark which in turn could create a fire hazard when fueling a vehicle parked beneath the transmission line. However, there have been no reported incidents of fuel ignition due to transmission line-caused sparking. The occurrence of fuel ignition is unlikely because the following events must occur simultaneously:

- The vehicle must be well insulated from ground, as when it is moved on dry pavement on a dry day.

- The spout pouring gasoline must be grounded, for instance through the body of a person standing on humid ground or vegetation.

- The spark occurs in the region where the fuel vapor and air mixture has a concentration close to the stoichiometric proportion.

Transmission lines are designed for clearances at road crossings. This design reduces the electric field strength and further lowers the probability of fuel ignition. As a protective measure, farmers and other equipment operators whose property is crossed by the transmission line would be cautioned against refueling directly under the transmission line.

Persons operating irrigation systems near the transmission lines would be warned that sections of pipe and solid streams of water should not pass near the transmission line conductors. When contact between a well-broken stream of water and the conductors cannot be avoided, the distance of 17-40 m (55-130 feet) between the conductors and the spray nozzle would be maintained.

5.13.5 Cumulative Electrical Effects

When transmission lines are constructed on adjacent ROWs some electrical effects are cumulative. Where the 345-kv ROW parallels Western's 230-kv line, RI may be slightly increased. Since the line route would be designed to avoid residences closer than 90 m (300 feet), no adverse cumulative impact on radio reception should result from the combined effect of the two lines. Television reception would be similarly unaffected. The cumulative effect on audible noise could also increase. Neither of these increases would represent a major increase over the single-circuit condition.

Cumulative electric field effects would occur only between the 345-kv, 230-kv and 115-kv lines; no significant effect would be measurable on the outside of the outside phases of the combined ROW. Therefore, the cumulative effect between the two lines would be relatively minor. No harmful biological or health effects would result from the cumulative effect of the two lines.

5.14 Cumulative Impacts

Cumulative impacts are the combined effects of potential regional development that would occur during the period of construction and operation of the proposed project. Other projects that are planned for the study area include oil shale development, coal and mineral mines, water storage projects, and pipelines.

Projects that are located in the study area are listed on Table 5-3. Although these projects may contribute to increased cumulative impact, the schedules for many of these projects are uncertain at this time.

Oil shale development is occurring just north of Rifle in the Piceance Creek Basin of Rio Blanco County. Other projects are being developed in Garfield County. Most of the oil shale projects have been delayed indefinitely. Coal mining operations generally have been increasing in western Colorado every year and were expected to reach 22 operations by 1985. However, many of these mines are now operating on a minimum schedule because of decreased coal prices and lack of long term contracts. Several water reclamation projects sponsored by the Bureau of Reclamation have been proposed for the study area. These reservoirs would be used for a variety of reasons, which include desalination, water storage, water delivery, irrigation, hydroelectric generation, flood control, and recreation. Some are presently under construction. Major pipelines cross the southern portion of the project area and include the MAPCO liquid hydrocarbons pipeline and a CO_2 pipeline associated with the development of the McElmo and Doe Canyon CO_2 fields. Both pipelines would cross through Montezuma and La Plata Counties, Colorado, and San Juan County, New Mexico, passing through Corridor segments 30 and 31. The construction of the MAPCO pipeline has been completed.

Interrelated generation and transmission projects for the area are listed in Table 5-4. Future generation projects include the expansion of the San Juan Generating Station. Colorado-Ute's proposed Southwest Project has been postponed indefinitely. Future transmission line projects include those that would result from further development of the 345-kv system in western Colorado. For instance, following the completion of the Rifle-San Juan 345-kv proposal, Western intends to uprate its existing Rifle-Curecanti-Shiprock 230-kv transmission line. This uprating cannot occur until other satisfactory capacity is available. Therefore, the exact timing of the uprate has not been determined. Western would initiate a separate environmental process for the uprate. The uprating has been referred to as Phase II in the Colorado PUC proceedings on the proposal. Additionally, a second 345-kv transmission line may be necessary if load growth and other system conditions warrant. This second line would likely parallel the proposed project. A separate environmental document would be prepared at the time the second circuit is initiated. The second single circuit has been referred to as Phase III in the Colorado PUC proceedings.

Table 5-3
REGIONAL CUMULATIVE DEVELOPMENT

Project	Description	Sponsor	Status
Oil Shale			
C-a Tract	in-situ recovery facilities	Rio Blanco Oil Co.	Planned
C-b Tract	in-situ recovery facilities	Occidental Oil	Delayed
Superior Tract	oil shale-nahcolite - dawnsonite operation	Superior Oil Shale co.	Delayed
Colony	mining and recovery facilities	TOSCO	Indefinitely Postponed
Clear Creek	mining and recovery facilities	Chevron Shale Oil	Planned
Union	mining and recovery facilities	Union Oil Co.	Under Construction
Pacific Mobil	mining and recovery facilities	Mobil Oil Co. & Pacific Minerals	Planned
Coal and Minerals			
Mt. Gunnison	underground mine	Atlantic Richfield	Production
Coal Fuels	underground mine	Coal Fuels Corp	
Sheridan	underground mine	Salt Creek Mining Co.	Minimal Production
Coal Canyon Mines and Cottonwood Creek	underground mine	Mid-Continent Coal and Coke Co.	Production
Cameo Mines	underground mine	GEX Colorado Co.	Production
Hawk's Nest	underground mine	Western Slope Carbon	Production
Tomahawk	surface and underground mine	Texas Gulf	Minimal Production
Coalby-Red Canyon	underground mine	Grand Mesa Coal	Minimal Production
Mt. Emmons	molybedenum mine	Amax	Delayed

Table 5-3
REGIONAL CUMULATIVE DEVELOPMENT
(continued)

Project	Description	Sponsor	Status
Water Projects			
Diamond Fork	multiple-use reservoir hydroelectric pumped-storage generator	BOR	Planned
Dominguez	multiple use reservoir hydroelectric generation	BOR	Planned
Dolores	reservoir and irrigation system	BOR	Under Construction
Animas-La Plata	multiple use reservoirs	BOR	Planned
Dallas Creek	multiple use reservoirs	BOR	Under Contruction
Grand Mesa	multiple use reservoirs	Grand Mesa Water Conservancy District	Planned
Dunham Point	hydroelectric pumped-storage	BOR	Planned
Paradox Valley	desalination facility	BOR	Under Construction
Grand Valley	desalination facility	BOR	Planned
Lower Gunnison	desalination facility	BOR	Planned
Tri-County	storage reservoir	Colorado-Ute	Indefinitely Postponed
Pipelines			
Wasson Field CO_2	CO_2 extraction and pipeline facilities	Shell and Mobil Oil	Production
Liquid Hydrocarbon Pipeline	transport various hydrocarbons from Wyoming to Texas	Mid-America Petroleum	Production

Table 5-4
INTERRELATED PROJECTS AND PROPOSALS

Project	Description	Sponsor	Status	Interrelationship
Craig Station	coal-fired generating station	Colorado-Ute Tri-State Salt River Project Plate River Munic. Power	operational	major generation source
Hayden Station	coal-fired generating station	Colorado-Ute Salt River Project	operational	major generation source
Nucla Station	coal-fired generating station	Colorado-Ute	operational	minor generation source
Bullock Station	coal-fired generating station	Colorado-Ute	operational	minor generation source
Ames-Tacoma Stations	hydroelectric	Colorado-Ute	operational	minor generation source
Collbran Station	hydroelectric	Bureau of Reclamation	operational	minor generation source
Southwest Project	coal-fired generating station	Colorado-Ute	indefinitely postponed	major generation source
San Juan Station	coal-fired generating station, switchyard	PSNM TG&E	operational expanding	pooling capacity available through IPP interconnection with PSNM, Western, TG&E
Rifle-Shiprock	230-kv transmission line	Western	operational	common corridor segments possible, interconnection at several points
Rifle-NM Border	115-kv transmission line	Colorado-Ute	operational	common corridor segments possible, interconnection at several points

Table 5-4

INTERRELATED PROJECTS AND PROPOSALS (cont)

Project	Description	Sponsor	Status	Interrelationship
Shiprock-NM border	115-kv transmission line	PSNM	operational	common corridor segments possible
Craig-Rifle	230/345-kv and 138-kv lines	Colorado-Ute	operational	interconnection at Rifle
San Juan-Shiprock	345-kv transmission line	Western PSNM	operational at 230 kv	interconnected at San Juan switchyard
Shiprock	230-kv substation	Western	operational	interconnection point with Western's lines
Shiprock Stage 03	345-kv substation additions	Western	planned	interconnection point with future 345-kv lines
Grand Junction Loop	230-kv line around Grand Junction	PSC	planned	interconnect at Grand Junction
Rifle-Curecanti-Shiprock (Phase 2)	uprate existing 230-kv line to 345-kv	Western	planned	interconnections at North Fork and Norwood
Rifle-San Juan (Phase 3)	345-kv transmission line	Colorado-Ute Western	planned	interconnection with present Colorado-Ute System
Hayden-Blue River	230-345 kv transmission line	Tri-State Western Colorado-Ute Platte River Power Authority	planned	interconnection with Western and Public Service Company of Colorado system
Colorado Intertie	345-kv transmission line	Plains G & T PSC	planned	

The construction of the proposed project would provide transmission capacity for regional growth of other energy related and mining projects. However, the construction of the 345-kv transmission line would not interfere with the extraction of mineral resources in the area. The project would provide adequate capacity to southwest Colorado areas for growth that is anticipated for the future. Additionally, the project participants would satisfy contractual obligations for transfer and wheeling of power in the region, as well as meeting load requirements in their respective systems.

Cumulative impacts of these projects would be both beneficial and detrimental to the environment of the area. Employment and an increased tax base for the counties are favorable impacts of regional growth. However, the population influx into the area can create unfavorable impacts to public and social services and housing. Many of the projects would require a large number of workers during the construction phase; however, once construction is completed the total work force would decrease from the peak level. The exception is mining operations which would continue stable employment while mines were in full operation. The total influx of people in the area is estimated to be approximately 46,000 persons by 1985. Based on potential regional expansion, the BLM estimates that approximately 40,268 ha (99,050 acres) may be disturbed in 1980, 11,240 ha (28,100 acres) in 1985 and 14,360 ha (35,900 acres) in 1990. These estimates are for Garfield, Mesa, Delta, Pitkin, Montrose, Gunnison and Ouray Counties, and include expansion of existing energy projects, new projects, community expansion, road construction and new power, pipe and telephone lines. Approximately 10,000-15,000 ha (25,000-37,500 acres) may be disturbed in the southern section of the project area. Overall, there would be a loss of area vegetation and a reduction in the available wildlife habitat in the region.

Additional cumulative impacts related to the proposed project are discussed in Sections 5.1 through 5.13.

5.15 Mitigation Plan

This section describes the measures to be implemented by the participants in order to mitigate any adverse environmental impacts resulting from the proposed 345-kv transmission line project. Site-specific stipulations for construction on federal lands would be included in separate authorizing documents; the plan of construction, operation, and rehabilitiation required in Section 504(d) of the Federal Land Policy and Management Act. This plan would include specific mitigative measures to ensure preservation of environmentally sensitive areas and would

ultimately become a part of the Grant of Right-of-Way and Authorizing Document issued by BLM and FS, respectively. This plan would be prepared following the Record of Decision for the project and prior to the initiation of construction.

In addition, the CEQ regulations (40 CFR 1505.3) require that the lead agency provide for monitoring to insure that essential commitments are carried out and mitigation measures performed. In the event that REA provides financing assistance for this project, REA would request a mitigation plan, based on the FEIS, of measures to be taken during construction, operation, and maintenance of the proposed facilities and would keep a record of the success of that mitigation plan.

The various mitigation measures are also described in Section 5.0. These measures include:

General

- The design, construction, operation, and maintenance of the line would follow the applicable criteria set forth in the Environmental Criteria for Electric Transmission Systems published jointly by the USDA/USDI and Management of Transmission Line Right-of-Way for Fish and Wildlife published by the USFWS and the National Forest Landscape Management Handbook published by USDA (1975).

Geological Hazards

- Disturbed soil surfaces would be returned to the original grade or to a grade satisfactory to the owner or land manager.

- Permanent maintenance roads would be aligned and graded to conform with the natural landscape.

- Damage to access roads would be repaired.

- Where possible, towers would not be located on unstable or potentially unstable slopes.

- Active fault areas and epicenters would be avoided if possible. Towers and substation structures would be designed and constructed in conformity with applicable engineering and building standards. Should it prove unavoidable to place a tower near an active fault, the

tower location would be selected on the basis of its expected seismic response.

Soils

- Clearing and grading of construction storage and staging areas would be limited.
- Construction activities would be closely monitored to insure that soil disturbance and damage to vegetation is kept to a minimum.
- Construction activities during excessively muddy soil conditions would be restricted.
- Disturbance of steeply sloping areas and highly erodible soils identified by soil investigations during the design phase would be avoided as much as possible.
- Where soil is exposed during construction, erosion would be minimized by filling in ruts, terracing, riprapping, diking or spreading a straw mulch on the surface. Land management agencies and landowners would be consulted on vegetation restoration and clean-up measures prior to their implementation.

Water Resources

- Construction of new access roads near stream banks would be limited, where practical.
- Revegetation would be done and sediment control structures would be used to control erosion in the vicinity of streams and rivers in accordance with FS Guides for Controlling Sediment Form Secondary Logging Roads (USDA, FS).
- Stream banks would not be disturbed unnecessarily and riparian vegetation would be left intact where possible.
- Fill material would not be placed in streams or adjacent areas where excessive siltation may occur.
- Tower structures would be sited so that, to the extent practicable, they can be constructed and maintained

without altering the stream or introducing sediments or contaminants into the water.

- Streams would be crossed at existing crossings or with temporary facilities. Culverts would be used where necessary.

- Construction of access roads in and near river crossings would be in accordance with the requirements of the U.S. Army Corps of Engineers' Nationwide General Permit for Utility Line Crossings and as specified by the applicable permits and grants of right-of-way issued by other agencies.

- Herbicides would not be used on the banks of streams or where runoff would wash the herbicides directly into a stream. The use of herbicides in substations would be in accordance with the label directions as required by the Federal Insecticide, Fungicide, and Rodenticide Act of 1972 and as recommended by the appropriate agency.

- Herbicides, oil, and other chemicals would not be stored or disposed of in such a way as to allow drainage into surface or underground waterways.

- Post-construction removal of debris would be performed in a manner to avoid adding contaminants to the water.

<u>Vegetation</u>

- Trees in the ROW would be topped and selectively removed to blend with the landscape to provide for conductor safety.

- Protection of vegetation would be given consideration throughout the planning and construction phases of the project. In wooded areas, tower structures would be sited to reduce the disturbance of trees, when possible.

- Appropriate precautions against fire would be taken during construction and maintenance.

- Existing corridors and access roads would be used whenever practical to reduce potential impacts to undisturbed areas. Prior to designating access routes and

staging areas, the appropriate landowner or land manager would be consulted.

- Respective land management agencies would also be consulted during transmission line design, which includes transmission center line alignment, tower location, pull sites, etc. The (USDA/USDI) Environmental Criteria for Electric Transmission Systems and National Forest Landscape Management Handbook (USDA, FS 1975), would be followed to the extent practical during the design, construction, and maintenance of the proposed transmission line.

- Disturbed federal lands not committed for the life of the project would be allowed to return to their original state or revegetated according to SCS recommendations or BLM and FS requirements.

- Riparian areas would be avoided or spanned wherever practicable.

- Existing trees in the ROW would be properly "feathered" to create curved undulating boundaries, while allowing for safe operation of the line.

- Maintenance personnel are normally expected to require entry on the ROWs one to two times per year. More frequenty entrys may be required if operational problems occur on the line. In the event that soils or vegetation are damaged during emergencies or storms, restoration procedures would be the same as those employed during and after construction. During maintenance inspections, any problems with conductor clearance or soil erosion would be noted and corrected.

- Public access to the ROW would be restricted according to landowner or land manager request.

- Pesticides and herbicides would not be applied to the ROW. In and near substations, only chemicals recommended by the appropriate authorities, such as the USDA and USDI, would be employed. Chemicals would be applied in accordance with the Federal Insecticide, Fungicide and Rodenticide Act of 1972.

- With the exception of the new substation at Long Hollow construction would be within or immediately adjacent to

existing substations. This would minimize disturbances to presently undisturbed areas.

Wildlife

- Timing of construction activities would be planned in cooperation with land management and fish and wildlife agencies to minimize disturbances during the reproductive seasons of species such as mule deer, elk and antelope. Special attention would be given to the months of May through July to avoid disturbance to the calving and fawning activities.

- Mule deer and elk migration areas and critical winter range would be identified and avoided during critical months. Critical winter months may include November through May. The exact avoidance period of critical winter areas would be specified during the ROW approval process.

- Human disturbance to wildlife within the ROW could be restricted by blocking or locking gates to ROW access roads as needed.

- Riparian vegetation and wetland areas would be avoided or spanned where practical in accordance with Executive Order criteria.

- Waterfowl concentration areas would be avoided where practicable. Additionally, the transmission line would be designed to be as high above water surfaces as practical.

Wetlands and Riparian Areas

- Wetlands and riparian areas would be avoided where possible during the delineation of the ROW, centerline, tower locations and substation facilities. Wetlands and riparian areas that cannot be entirely avoided would be spanned without construction in the wetlands.

- Wetlands would be avoided during maintenance of the proposed project.

- Construction of access roads would not be permitted in wetlands.

- Sediment control structures would be used near wetlands.

- Riparian vegetation would not be removed except tall trees would be topped that conflict with transmission line operation.

- Fill material would not be placed in wetlands.

- Any lubricating oils or fuel for equipment motors would be carefully handled and disposed.

Floodplains

- Floodplains would be avoided where possible. Those floodplains which cannot be completely avoided would be spanned without construction in the floodplain if possible.

- Any tower structures that must be built in floodplains would be designed to withstand the 100-year flood (that flood with a one percent chance of occurring in any given year).

- Structures would be placed where the likelihood and severity of flooding is expected to be lowest.

Threatened and Endangered Species

- Regions within the study area where the threatened and endangered plant species may occur were identified and avoided to the extent practicable during corridor selection.

- During centerline location and prior to construction of access roads and substation facilities, a qualified botanist would inspect the ROW, access roads, and substation sites in those areas where federally designated threatened and endangered plant species may occur to insure that these species would not be impacted. All such species that are identified would be avoided or, if recommended by the USFWS and land management agencies, transplanted prior to construction of the transmission and substation facilities.

- Timing of construction activities would be planned based on consultations with the appropriate agency to

minimize disturbance to the reproductive seasons of sensitive species.

- Peregrine falcon and bald eagle nests and eagle roosting sites would be identified and avoided during critical months.

- Critical winter months may include November through May (BLM 1980d). The exact time frame may vary from year to year and in specific locations within the study area. Critical areas and periods during which they will be avoided by construction activities would be specified during the ROW approval process.

- Important bald eagle roost sites identified by the BLM, FS, CDOW, or USFWS would be avoided.

- All conductors for the proposed line would be separated by at least 7 m (24 feet). Since the eagle wing span ranges from 1.8-2.4 m (6-8 feet), the proposed conductor spacing would be adequate to prevent electrocution.

Cultural Resources

Known historic and archaeological resources listed or eligible for listing on the NRHP would be avoided.

- A cultural resource survey would be completed for the transmission line ROW and new and expanded substations. If sites listed or eligible for listing on the NRHP are discovered, no construction would be initiated until the procedures prescribed in the ACHP Regulations, 36 CFR 800, have been carried out.

- If construction should be contemplated outside the boundaries of the area surveyed, the additional area would be surveyed at that time. If any sites are found during construction, work would be stopped until authorities are notified and an archaeologist can proceed to the site to make an appropriate assessment.

Land Use

- The proposed transmission facilities will be constructed in compliance with all applicable federal

regulations to minimize interference with any existing transportation systems or to reduce hazard to airports or navigable airspace.

- FAA officials would be provided with design and centerline information to assure minimal impact to navigation. Hazard markers would be placed on lines where required.

- An exact determination as to where energy or mineral resource lands occur would be made when the transmission line's ROW is identified. During the ROW approval process, a resolution of any energy lease-transmission line conflicts would be sought through consultations with all affected parties.

- Land management agencies would be reimbursed for any commercial timber removed or damage to young growth because of ROW clearing activities. Timber below commercial size would be paid for at current appraised value.

- In agricultural areas, the centerline would be located along property, section, and fence lines to minimize disturbance to agricultural lands, where practicable.

- All fences cut or damaged during construction would be repaired, and gates would be installed in fences to prevent livestock from escaping.

- In areas where the line must cross prime, important or irrigated farmlands, the towers would be carefully located to minimize disturbances. Access roads and staging areas would, where possible, be located away from farmlands.

<u>Human Resources</u>

- Consultation with local planning agencies on a continuing basis in establishing the line route within the proposed corridor would minimize the impact to high density areas.

- Any easements required on private land would be based on negotiations with landowners. Colorado-Ute is coordinating its planning activities with the Southern Ute tribal officials to insure that the ROW is compatible with their land use plans.

- Appropriate permits would be obtained prior to final centerline location and construction.

- To minimize the potential for impacts to recreational resources, the project participants would coordinate with the appropriate administering agency in the identification of ROW centerlines and tower locations.

- Efforts would be made to locate the facilities in the least obtrusive and most environmentally compatible manner.

Visual Resources

- Manmade objects in the natural landscape generally become focal points because of contrasting form, line, color, and texture. The project will be designed to complement its natural surroundings.

- The National Forest Landscape Management Handbook (USDA 1975) and general construction methods listed in Environmental Criteria for Electric Transmission Systems (USDA, USDI) would be utilized to minimize aesthetic impact.

- ROW through forest and timber areas would be established with curved undulating boundaries wherever possible.

- Trees would be topped and pruned and existing small trees and plants would be used to feather the ROW from grass and shrubbery to larger trees.

- Centerline selection would avoid skylining the tower structures if possible by staying away from hilltops and ridges.

- Location and design would take into consideration the topography and vegetation to reduce the visual impact.

- Nonspecular towers, hardware and conductor would be utilized.

- In areas with high visual sensitivity and low visual absorption capability, the participants would consider the use of alternative design structures to minimize visual intrusions.

Electrical Effects

- New and existing fences in the immediate vicinity of the transmission line would be properly grounded, if necessary.

- Farmers and other equipment operators whose property is crossed by the transmission line would be cautioned against refueling directly under the line.

- Persons operating irrigation systems near the transmission lines would be warned that sections of pipe and solid streams of water should not pass near the transmission line conductor.

- Project design would include spacings of 17-40 m (55-130 feet) between the conductors and the spray nozzles of irrigation systems if the line passes through an area irrigated by irrigation systems.

- The proposed 345-kv transmission line would be designed in accordance with the National Electrical Safety Code and REA Bulletin 62-1.

- Any television or radio interference problems attributed to the proposed 345-kv transmission line would be corrected.

- The line would be designed to provide FCC satisfactory service under fair weather conditions for all residences 90 m (300 feet) or greater from the 345-kv line.

5.16 Unavoidable Adverse Environmental Impacts

A corridor selection methodology was implemented to minimize, where possible, the environmental effects of the 345-kv transmission line and associated facilities. Numerous construction and operating procedures and mitigation measures would be implemented by the project sponsors to further mitigate impacts. Nevertheless, certain adverse environmental impacts cannot be avoided during construction and operation of this line.

Potential impacts on soils would result from permanent disturbance of 22 ha (55 acres) by the construction of approximately 1,200 tower structures, one new substation and expansion of three existing substations. Some additional area would be disturbed by access roads. Erosion can also result in areas where revegetation is difficult.

There would be some disturbance of wildlife in the construction area. This disturbance would be short-term, however, because the duration of construction activity at any one location would be brief. Some forested habitat would be cleared during line construction. Approximately 109 km (68 miles) of conifer-aspen vegetation would be crossed. The maintenance of low-growth habitat, however, would promote the potential growth of more diverse species. This positive effect may be considered to offset somewhat the negative biological impact. A negligible increase in migratory bird mortality may occur. Some disturbance to calving and fawning areas for elk and mule deer cannot be avoided.

It may not be possible to avoid all cultural resources, especially those discovered during construction. Such cultural resources would be recorded and evaluated by a qualified archaeologist and, when necessary, mitigated in accordance with a plan approved by the participating Federal agencies and the SHPO.

Although the aesthetic impact of the proposed line would be mitigated somewhat by limited clearing near roads and use of existing ROW; the crossing of high visual impact areas, the disturbances to the ROW and the visual intrusion of the proposed facilities would create an unavoidable impact.

Some agricultural land would be removed from production by tower and access road locations. In addition, commercial timber within the ROW would be lost. The proposed project would pass through some areas of known mineral and energy resources.

5.17 Relationship Between Local Short-term Uses of Man's Environment and the Maintenance and Enhancement of Long-term Productivity

Energy resources and energy distribution systems enhance both long-term and short-term productivity of a region. The power line ROW is intended to be maintained for its proposed purpose for the life of the project. If the facility is abandoned at the end of its useful life, the area could revert to its present condition.

The short-term is defined as 35 years (the estimated life of the proposed project). Within the life of the project, the construction phase would represent the period of greatest impact to the physical environment. All but two of the proposed substations (Long Hollow and Norwood) would be constructed at existing sites, thereby minimizing their impact. Approximately 22 ha (55 acres) would be occupied by the transmission line towers and substations. Following the construction phase of the proposed action,

the majority of land disturbed during construction would begin to revert to its preconstruction use. Some access roads would be closed and rehabilitated.

Potential effects on air quality would be short-term, mainly localized, and largely the result of construction activities, which would create fugitive dust and gaseous emissions from ground transportation. No short- or long-term effects on water resources are anticipated. There would, however, be some short- or long- term soil erosion. No known geotechnical hazards such as subsidence, flooding, hydrocompaction or faulting would be increased, either short- or long-term.

Potential effects on ecological resources would be both short- and long-term, because of loss and displacement of vegetative and wildlife species. No vegetative or wildlife species are expected to be severely impacted as a direct result of project-related activities. The rate of wildlife habitat recovery would vary according to vegetative type.

Potential effects on land use would be both short- and long-term. The proposal would remove 0.22 ha (0.60 acre) of prime farmland from agricultural production over the life of the project. Future land-use plans and planning would also be affected, and to some extent determined, by the location of the proposed facilities.

Regional and local economies could be expected to experience short-term benefits from project-related expenditures. No long- or short-term dislocations to local communities are anticipated, because of the small numbers of workers, for relatively short periods of time, that would be required at various construction points over the construction period.

Short-term visual and acoustical impacts would occur throughout the entire project area. Long-term visual impacts would depend on abandonment procedures.

Cultural resources, which are nonrenewable, would be impacted for both short- and long-term. The degree of impact would depend on the mitigation implemented.

A new ROW of about 46 m (150 feet) wide would be acquired for this transmission line. Although the basic land use may not change appreciably in the ROW, certain land use practices would be modified. In nonforested ROWs, the only actual commitment of land on the ROW itself occurs directly beneath the structures.

On agricultural lands, certain field operations may have to be modified.

In forested areas, the commitment of land for transmission facilities represents a comparatively permanent use of that land. Tall trees within the ROW and all danger trees would be removed or topped and prevented from reestablishing themselves depending on the ROW landscape plan approved by the appropriate federal land management agency. This is necessary for maintaining required clearance and safety standards of the line. Vegetation management would result in an irreversible change in vegetation patterns and fauna relationships along the ROW until the line is abandoned.

5.18 Irreversible and Irretrievable Commitment of Resources

Some resources would be irreversibly and irretrievably committed during the construction, operation, and maintenance of the proposed line.

These include construction labor, fuels, chemicals to treat wood structures, and construction materials. Construction materials that would be utilized in the project include steel (towers and substation additions), concrete, gravel, aluminum, and copper. Maintenance of the proposed facility would require some long-term commitment of labor by the project participants.

The eventual disposition of the construction materials will depend on whether the participants decide to renovate or remove the project facilities at the end of the estimated life of the project. Certain other resources such as the metal in the lines and substation equipment can also be recycled.

A new ROW of about 46 m (150 feet) wide would be acquired for this transmission line. Although the basic land use may not change appreciably in the ROW, certain land use practices would be modified. In nonforested ROWs, the only actual commitment of land on the ROW itself occurs directly beneath the structures. In agricultural lands, certain field operations may have to be modified.

6.0 Consultation and Coordination

6.1 Scoping Process

Final regulations implementing the National Environmental Policy Act (NEPA), (November 29, 1978, 40 CFR Part 1500), provide for an early and open process to determine the scope of issues to be addressed and to identify the significant issues related to a proposed action. The regulations direct that this process occur as soon as possible after the deicision to prepare an environmental impact statement. The regulations further direct that the lead agency invite the participation of affected federal, state and local agencies, Indian tribes, and interested persons. The regulations are designed to determine the significant issues to be analyzed, and the scope with which they are to be treated in the environmental impact statement; and to identify and eliminate from detailed study insignificant issues or those addressed in prior environmental review.

An additional purpose of the scoping process is to inform potentially affected federal, state and local agencies and other interested persons. Alternative corridors are also identified, along with necessary consultation and review requirements. The objective of the scoping process is to enhance better decisions through the achievement of these purposes. The scoping process is also an on-going process where new concerns, issues and potential project changes are identified and evaluated.

The scope of the Rifle-San Juan 345-kv proposal has specifically evolved through a series of interagency meetings, public meetings, public and agency reviews of the DEIS, and the PUC's proceedings. Each one of these events identified major issues which have been taken into consideration during the development of the SDEIS. Furthermore, these events have influenced the definition of the current proposal, and have helped refine the corridors into the present corridor network. A discussion on how the scoping process and other events have redefined the proposal follows. A more thorough discussion on the background of the proposal is given in Appendix A.

Agency Meetings

Agency contacts began in May, 1979. At that time a simple alternative corridor network existed based on the connection of major load centers, the avoidance of major communities and environmentally sensitive areas, and the paralleling of existing transmission line corridors in accordance with the Federal Land Management Policy Act. These initial agency contacts led to the development of the Macro-Corridor Study which was released on July 27, 1979.

The Macro-Corridor Study was sent to agencies for review, and as a result of their review, further input was received at an inter-agency meeting held August 29, 1979, in Denver, Colorado. Table 6-1 summarizes the issues identified as a result of the Macro-Corridor Study review and the interagency meeting. Specific agency concerns are summarized in the Macro-Corridor Study. The corridor network was also expanded based on this agency imput.

Colorado-Ute sponsored additional agency meetings with the BLM, FS and Western on September 17, 1982, in Montrose; on October 1, 1982, in Grand Junction; and October 4, 1982, in Durango. Besides these meetings, Colorado-Ute held numerous meetings with state and local agencies concerning the location of the alternative corridor segments.

The four cooperating agencies met on February 23, and March 10, 1983, to discuss the development of the alternative corridor impact comparison, and again on April 19, 1983 to review the preliminary SDEIS.

Public Meetings

In accordance with NEPA regulations, REA conducted a series of public scoping meetings on the original 345-kv Rifle to San Juan proposal. These meetings were announced in the Federal Register and through local media. These meetings were held:

Rifle, Colorado	September 10, 1979
Grand Junction, Colorado	September 11, 1979
Dove Creek, Colorado	September 12, 1979
Montrose, Colorado	September 13, 1979
Cortez, Colorado	September 14, 1979
Norwood, Colorado	September 17, 1979
Delta, Colorado	September 18, 1979
Durango, Colorado	September 20, 1979
Farmington, New Mexico	September 21, 1979

Concerns expressed at these meetings contributed to the development of the original DEIS, the results of which also contributed to the development of this document. A summary of major issues is given in Table 6-2

A second series of advertised public information meetings were held for the revised Rifle to San Juan single circuit 345-kv transmission line as a continuation of the proposal's scoping process:

Table 6-1

Summary of Interagency Scoping Issues

- Impacts on navigational devices and airports
- Consideration of feasible alternatives
- Impacts on human resources
- Impacts on prime farmland
- San Miguel River crossing
- Impacts on cultural resources
- Secondary impacts
- 404 permitting requirements
- Cumulative impacts
- Waste disposal
- Geologic conditions
- Construction alternatives
- System alternatives
- Transmission system impacts
- Impacts on federal lands
- Impacts on unique natural resources
- Project costs
- Impacts on river crossings
- Corridor alternatives

Table 6-2
Summary of Public Meeting Issues

Location	Meeting Date	Summary of Issues
Rifle, CO Grand Junction, CO	9-10-79	Generating Capacity Power Interchanges; Construction Schedule; Cogeneration
Dove Creek, CO	9-12-79	ROW Clearing; Impacts to Farmland; Requirements; Impacts to Dolores River; ROW Width
Montrose, CO	9-13-79	Corridor Locations; Impacts on Helicopter Flying; Series Compensation
Cortez, CO	9-14-79	Impacts to Energy and Mineral Resources; Electrical Effects; Dolores River; Visual Impacts; Impacts to Farmland; Corridor Alternatives; Load Forecasts; Montezuma County Permit Requirements
Norwood, CO	9-17-79	Impacts on Wildlife
Delta, Co	9-18-79	Corridor Alternatives; Impacts to River Otters; Electrical Effects; Impacts to Farmland; Interrelationships of Other Projects; Load Estimates; System Alternatives; Energy Conservation Alternatives; Substation Location Alternatives
Durango, CO	9-20-79	Load Estimates; ROW Widths
Farmington, N.M.	9-21-79	None
DeBeque, CO	3-10-83	Colorado River Crossing; Radio and Television Reception; Visual Impacts; Restoration Practices

Table 6-2
(continued)

Rifle, CO	3-17-83	Design Alternatives; Road Construction; Impacts on Human Resources
Durango, CO	3-23-83	Long Hollow Substation Location Alternatives; Corridor Alternatives; Project Need; Issues from Public Utilities Commission Hearings; Impacts on Private Lands; Compensation for Private Lands; Condemnation Impacts
Montrose, CO	3-29-83	Impacts on Landowners
Palisade, CO	3-31-83	Impacts on Eagles; Impacts on Irrigated Cropland; PSC's 230-kv Grand Junction Loop; PSC Needs

DeBeque, Colorado	March 10, 1983
Rifle, Colorado	March 17, 1983
Durango, Colorado	March 23, 1983
Montrose, Colorado	March 29, 1983
Palisade, Colorado	March 31, 1983

The key issues identified during these meetings are summarized in Table 6-2.

<u>Original Draft Environmental Impact Statement</u>
The DEIS for the original double-circuit 345-kv line proposed was issued in July 1981, and meetings to receive comments on the DEIS were conducted:

Durango Colorado	August 11, 1981
Farmington, New Mexico	August 12, 1981
Montrose, Colorado	August 13, 1981

In consideration of the comments received on the original DEIS, an alternative impact comparison analysis was developed in consultation with the BLM and FS. Also, several modifications to the corridor network were made.

<u>Colorado Public Utilities Commission Proceedings</u>
As discussed in Appendix A, the PUC denied Colorado-Ute a Certificate of Public Convenience and Necessity for the original proposed double-circuit 345-kv line. However, prior to the denial, the PUC Hearing Examiner recommended approval of the original proposal from Delta, Colorado and south, but ordered Colorado-Ute to study other alternatives and to solicit further participation between Rifle and Delta. The transmission line proposal described in this document includes the participation of PSC as was recommended in the Examiner's recommended decision.

<u>Supplemental Draft Environmental Impact Statement</u>
REA issued a Notice of Intent to prepare the SDEIS on March 18, 1983, and announced that information and comments received on the DEIS for the double-circuit proposal will be considered and utilized in the preparation of the SDEIS. This was done in the development of the SDEIS. Furthermore, REA announced that comments concerning the proposal will be solicited at the time the SDEIS is issued.

6.2 <u>Coordination and Review of The Supplemental Draft Environmental Impact Statement</u>

The following list identifies those federal, state, and local agencies, groups and interested individuals that received a copy of the SDEIS to review:

Federal Agencies

Advisory Council on Historic Preservation

Department of Agriculture
- Farmers Home Administration
- Forest Service
- Soil Conservation Service

Department of the Army
- Army Corp of Engineers

Department of Energy
- Western Area Power Administration
- Federal Energy Regulatory Agency

Department of the Interior
- Bureau of Indian Affairs
- Bureau of Land Management
- Bureau of Mines
- Bureau of Reclamation
- Fish and Wildlife Service
- Geological Survey
- National Park Service
- Office of Surface Mining, Reclamation and Enforcement

Department of Transportation
- Federal Aviation Administration
- Federal Highway Administration

Environmental Protection Agency

State Agencies

State of Colorado
- Colorado State Clearing House

State of New Mexico
- New Mexico State Clearing House

Local Agencies

County Planning Staffs and County Commissioners:
- Garfield, Mesa, Delta, Montrose, Ouray, San Miguel, Dolores, Montezuma, La Plata (Colorado); San Juan (New Mexico)

Mayor
- Cities of Rifle, De Beque, Grand Junction, Delta, Montrose, Norwood, Cortez, and Durango, Colorado, and Aztec and Farmington, New Mexico.

Legislators

Federal

Senator William Armstrong
Senator Gary Hart
Representative Ray Kogovsek

State Senators

Tilman M. Bishop
Michael Callihan
Dan D. Noble
Richard M. Soash

State Representatives

Vicki Armstrong
Ben Nighthorse Campbell
Lewis H. Entz
Scott McInnis
James M. Robb
Glenn Underwood

Non-Government Organizations

Southern Ute Indian Tribe
Ute Mountain Indian Tribe
Council of Energy Resource Tribes
The Benham Group
Colorado State University
Colorado National Wildlife Federation
Western Slope Energy Research Center
Western Interstate Energy Board
The Nations Project
Bronco Exploration
Southwest Research and Information Center
County and Municipal Libraries
Western Colorado Congress
Friends of the Earth
Plains Electric Generation and Transmission, Inc.
Colorado-Ute Electric Association, Inc.
Public Service Company of Colorado
Tri-State Generation and Transmission Association, Inc.
Public Service Company of New Mexico
Tuscon Gas and Electric

Interested Persons

Gerald Nickles
Vern Gwaltney
Pati Temple
Jane L. Banes
Jean Lesky
Lynne Womble-Kenney
Bill Lemons
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Dave Williams
Tamara Wiggams
Jean McCulloch
Bill Hofmann
Warren Stricker
James A. Ericson
Jack W. Scott
Dan MacArthur
Jim Paradiso
Don Demarest
Mr. & Mrs. F. Montoya
Michel Mohr
Preston Ellsworth
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Bill Cooper
Mark Kurtz
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Fred Wetlaufer
David Anderson
Ronald Brown
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Carol Gibbs
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William & Lois Jutten
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Appendix A

Project History

Appendix A

Project History

A.1 Background

The makeup of the Rifle-San Juan Transmission Line Project has been subject to change since first being proposed. In early 1979, Colorado-Ute proposed a single circuit 345-kv line from Rifle to San Juan; however, Colorado-Ute through a joint planning function was talking with PSC and Western about joint participation in a second 345-kv circuit or double-circuiting all or a portion of the Rifle-San Juan line. In early 1980, the plan was for Colorado-Ute to construct a single-circuit 345-kv line from Rifle-Paonia/Hotchkiss-Delta; a double-circuit line from Delta-Montrose-Norwood-Lost Canyon; and a single-circuit from Lost Canyon-Hesperus-San Juan. PSC and Western were planning on constructing a single-circuit 345-kv line from Rifle-Cameo-Grand Junction-Delta; buying and sharing the capacity of one of Colorado-Ute's 345-kv circuits between Delta and Lost Canyon; and constructing a new 345-kv circuit between Lost Canyon and Shiprock.

During the fall of 1980, PSC notified Colorado-Ute that they would not participate in the Rifle-San Juan Transmission Line Project due to financial consideration and timing of its need for additional facilities. At that time, Colorado-Ute and Western continued project planning for a double-circuit 345-kv line with Colorado-Ute acquiring the capacity of PSC, and the project being double-circuited from Rifle-Paonia-Delta-Montrose-Norwood-Hesperus-San Juan, with one circuit extending on to Shiprock. This project plan is discussed further in Section II.B.

A.2 Original Project Plan-Described in Environmental Analysis (1981).

1. Routing - Rifle to North Fork (Paonia), to Delta, to Montrose, to Norwood, to Lost Canyon, to Durango (Hesperus), to San Juan, one circuit on to the Shiprock Substation. The original proposal was routed through the North Fork area and included a substation to serve Delta-Montrose Electric Association and the Gunnison County Electric Association.

2. Capacity - Colorado-Ute, 70%; Western, 30%. A double-circuit 345-kv line has a nominal capacity of 1,000 mw.

3. Project Components - Double-circuit 345-kv transmission line from Rifle-San Juan with one circuit extending on

to Shiprock, NM. Substations were to be located at Rifle, North Fork, Delta, Montrose, Lost Canyon, Hesperus, the San Juan Generating Station and the Shiprock Substation. The estimated project cost was 240 million dollars and was to be shared between Colorado-Ute and Western according to capacity entitlements.

A.3 EIS Process

1. Agency Contacts - Colorado-Ute contacted federal and state agencies by letter dated May 11, 1979, and requested input on corridors identified at that time. The following agencies were contacted: Bureau of Land Management, Forest Service, National Park Service, U.S. Fish and Wildlife Service, U.S. Army Corps of Engineers, Soil Conservation Service, Federal Aviation Administration, U.S. Geological Survey, Heritage Conservation and Recreation Service, Environmental Protection Agency, Bureau of Indian Affairs, Federal Emergency Management Agency, Federal Energy Regulatory Commission, Colorado State Clearinghouse, New Mexico State Clearinghouse, Colorado State Historic Preservation Officer, and New Mexico State Historic Preservation Officer.

2. Macro Corridor Study - Preparation of a Macro Corridor study is required by REA Bulletin 20-21:320-21. The study includes macro analysis in which general criteria, literature search and agency consultation are used to identify a reasonable range of potentially acceptable corridors. Colorado-Ute and Burns & McDonnell developed a macro corridor study for the project. The study included a discussion of the need for the project, potential transmission corridors, a description of the proposed facilities, and environmental constraint identification and evaluation. Colorado-Ute submitted the study to REA who distributed it to those agencies listed in A.3.1 and to the county planners of affected counties on July 27, 1979.

3. Interagency Meeting - An interagency meeting was held August 29, 1979 in Denver, Colorado. The purpose of the meeting was to provide information on the project, identify potential environmental problems, establish the lead and cooperating agencies for the NEPA process, and define and describe REA's role in the project. Those agencies attending the meeting included: Delta County Development Department, BLM, CDOW, National Park Service, REA, Public Service Company of New Mexico,

PSC, FS, U.S. Army Corps of Engineers, and the Federal Aviation Administration.

4. Public Scoping and Information Meetings - Colorado-Ute and REA conducted public scoping and information meetings in September at several locations in western Colorado and northwest New Mexico. The purpose of these meetings was to inform the public about the project and solicit their input and identify their concerns.

Date	Location
September 10, 1979	Rifle, Colorado
September 11, 1979	Grand Junction, Colorado
September 12, 1979	Dove Creek, Colorado
September 13, 1979	Montrose, Colorado
September 14, 1979	Cortez, Colorado
September 17, 1979	Norwood, Colorado
September 18, 1979	Delta, Colorado
September 20, 1979	Durango, Colorado
September 21, 1979	Farmington, New Mexico

5. Development of Environmental Analysis - Subsequent to the interagency and public information meetings, Burns & McDonnell developed an Environmental Analysis in accordance with REA Bulletin 20-21:320-21. The Environmental Analysis was submitted to REA in April, 1981.

6. Preliminary Draft Environmental Impact Statement - REA prepared a preliminary DEIS in April, 1981, which was transmitted to Colorado-Ute, BLM, FS and Western for their review and comment. The major comments from the FS included the following:

   Project alternatives should be presented in comparative form: a corridor from Rifle-Grand Junction-Delta should be evaluated in the DEIS: they disagreed with the preferred corridor between Montrose and Norwood; and all routes identified by San Juan National Forest Supervisor for Mancos-Durango area should be evaluated.

   Major comments from the BLM included the following:

   The interrelationship between the Rifle-San Juan Project and Southwest Project needed better definition; further evaluation of a

Rifle-Grand Junction-Delta corridor needed: comparative evaluation of alternatives needed; criteria for selection of preferred corridor; and potential environmental impacts were not quantified.

7. DEIS - REA prepared a DEIS for the project and distributed it in July 1981.

8. Hearings and Public Comment on DEIS - REA held three public comment meetings during August 1981 to receive comments on the DEIS. The first meeting was held in Durango, Colorado on August 11, 1981. Two people spoke at the meeting concerning the limitations on private land use the project would have. The second meeting was held in Farmington, New Mexico, on August 12, 1981, and no one attended. The third meeting was held in Montrose, Colorado on August 13, 1981. It was well attended; 22 individuals spoke. All but one of the speakers either opposed the project or was critical of the DEIS. Major concerns included: the accuracy of Colorado-Ute's power requirements study and the need for the project; inadequate evaluation of alternatives; the relationship of the Southwest Project and Tri County Reservoir to the Rifle-San Juan Project; inadequate analysis of secondary and cumulative impacts; the role of the Western Area Power Administration; Colorado-Ute's ability to finance the project; the DEIS was not readily available for review; and no assessment of economic impacts (i.e., how it will affect rate payers).

A.4 <u>Certificate of Public Convenience and Necessity</u>

1. Date Original Application Filed - October 10, 1980

2. Intervenors to the Proceedings - The following parties were intervenors to the proceedings:

   Mr. Ronald K. Dessain
   High Country Citizens Alliance
   Wrights Mesa Electric Consumers Association
   Empire Electric Association
   Mr. Robert T. Colgan, Mr. James M. Jackson & Mr. Ben P. Shaw
   Western Colorado Utility Task Force
   Gunnison River Coalition
   Delta-Montrose Electric Association

3. Hearing Dates - Hearings on the application were held in Montrose, Colorado on May 18-20, 1981 and July 14-17, 1981.

4. Recommended Decision of Hearing Examiner - On November 13, 1981, the PUC hearing examiner, Robert E. Temmer, issued a recommended decision on the application. Mr. Temmer recommended that a certificate of public convenience and necessity be granted for the project as proposed, south of the Delta-Montrose area. North of the Delta area, Mr. Temmer recommended that Colorado-Ute contact Western and PSC and investigate the feasibility of uprating Western's Rifle-Curecanti 230-kv line to 345 kv and uprating PSC's Rifle-Cameo 230-kv line to 345 kv and extending the line on to the Delta-Montrose area. The study was to be filed with the Commission within 45 days of the effective date of the order.

5. Decision of Public Utilities Commission - On February 5, 1982, the Public Utilities Commission issued a decision that denied in totality Colorado-Ute's application for a certificate of public convenience and necessity. The Commission denied Colorado-Ute's application despite the recommendation of its staff and the presiding hearing officer.

6. Application for Rehearing, Reargument, or Reconsideration - On March 31, 1982, Colorado-Ute filed with the PUC an application for rehearing, reargument, or reconsideration of the Commission's February 5, 1982, decision. The application was a rebuttal to the Commission's decision and also contained a restructured Rifle-San Juan Project, to be constructed in three phases, for the Commission to consider.

   a. Phase I included:

      1) Constructing a double-circuit 345-kv line from Colorado-Ute's Grand Junction Substation to the San Juan Generating Station but conductor was to be strung on only one side of the towers: ownership Colorado-Ute 50% share, Western 50% share;

      2) Constructing a double-circuit 345-kv line from Colorado-Ute's Rifle Substation to Colorado-Ute's Grand Junction Substation: ownership - Colorado-Ute 37.5% share, Western 37.5% share, PSC 25% share;

3) Uprating an eight mile section of Western's 230-kv transmission line between Shiprock Substation and Four Corners Generating Station, Colorado-Ute 50% share, Western 50% share:

4) Constructing 345/115-kv substations at Montrose, Norwood, and Hesperus: Colorado-Ute 100% share: and

5) PSC extending its existing Rifle-Cameo 230-kv line to Colorado-Ute's Grand Junction Substation, with Colorado-Ute to terminate the line and grant PSC a license to install a 230/115-kv transformer.

b. Phase II included:

1) Upgrading Western's existing Rifle-Shiprock 230-kv line to 345 kv: Colorado-Ute 50% share, Western 50% share:

2) Constructing a 345/115-kv substation in the North Fork area and at Lost Canyon: Colorado-Ute 100% share:

3) Constructing a 345-kv transmission line between Curecanti and Montrose: Colorado-Ute 50% share, Western 50% share: and

4) Installing a 345/230-kv substation at Curecanti and 345-kv switching facilities at Montrose: Colorado-Ute 50% share, Western 50% share.

c. Phase III included adding a second circuit to the double-circuit towers between Grand Junction Substation and San Juan-Shiprock when required by electrical loads: Colorado-Ute 50% share, Western 50% share.

7. Application Denied - On April 13, 1982, the Public Utilites Commission denied Colorado-Ute's application for rehearing, reargument, or reconsideration.

8. Date of New Filing - On August 6, 1982, Colorado-Ute and PSC filed a new application for a Certificate of Public Convenience and Necessity for the single-circuit 345-kv transmission line between Rifle Substation and San Juan Generating Station.

A.5 Status of Permit Applications

BLM & FS - Colorado-Ute filed applications with the BLM for a grant of right-of-way and with the FS for Authorizing Documents for the Rifle-San Juan transmission line in 1980. Both agencies have stated that permits will not be issued until after they adopt the EIS and issue their own Record of Decision. Prior to the agencies issuing these permits, Colorado-Ute will have to submit certain site specific project information including a plan of operations, maintenance and termination required by the BLM, and an environmental protection plan required by the FS. Colorado-Ute met with the FS and BLM on September 17, 1982, October 1, 1982, and October 4, 1982, to review the current project proposal and reach a concensus on the proposed routing or identify those areas where additional work was needed to reach a concensus.

A.6 Preliminary Supplemental Draft Environmental Impact Statement

REA prepared a Preliminary SDEIS in April 1983, and had it transmitted to the FS, BLM, Western and Colorado-Ute for review and comment.

Appendix B

Methodology For Impact Rating System

Appendix B

Methodology For Impact Rating System

The alternative corridors proposed for the Rifle-San Juan Transmission Line Project were analyzed using a numerical procedure adapted from that used by the BLM on the Moonlake Project EIS (BLM 1981a). The procedure provides a systematic approach to comparing alternatives based on the relative seriousness of expected impact on a variety of environmental resources. The system results in an impact score for each alternative within each resource category included in the analysis. This score can then be used to compare and rank alternatives based on the relative potential for impacts in that resource category. It is important to note that the scores are only to be used as a tool in the decision-making process. Other nonquantifiable factors also must play a key role in the process. These include engineering constraints, costs, political considerations, agency input, land management policies, etc.

The purpose of this appendix is to provide a more thorough explanation of the system used and to explain the derivation of the impact values used in the analysis.

B.1 General Approach

A list of resource categories (e.g. wildlife) to be potentially impacted by the project and that would be useful in making comparisons between alternatives was identified.

These categories are vegetation, riparian/wetlands, geologic hazards, erosion hazards, reclamation potential, visual impacts, human resources, land use, cultural resources, and wildlife. Descriptions and quantities for most resources used in the numerical value procedure were obtained from the maps, profiles, and discussions presented in Section 4.0. Other sources used are noted where appropriate later in this discussion.

The resource categories are composed of several more specific resource types termed data items. For example, the vegetation category consists of such data items as conifer-aspen, saltbush-greasewood, and mountain shrub.

Each data item was then assessed as to the seriousness of the potential impact expected if the line was to be constructed through it. As a result of the assessment, each data item was placed into a low, moderate, or high category and assigned an

impact value of 1, 2, or 4, respectively. Each successively higher category was considered to be about twice as potentially detrimental in impact as the one before it.

The length, in miles, that each data item was crossed by the corridor was then determined. Some data items (i.e., as stream crossings) were recorded as number data rather than linear miles. The data item value was then multiplied by the number of miles (or times) the resource was crossed to yield an impact score for that particular resource. Data item scores were then totalled by resource category to facilitate alternate corridor comparisons.

Using distance measurement (miles) as a basis for impact estimates has the advantage of relating impacts to corridor or segment lengths. This helps account for the greater potential impacts on longer segments, thus favoring shorter corridors if there is no difference in sensitivity between segments. However, only those resource categories which are continuous over all land areas, such as erosion hazard or visual resources, exhibit this advantage. Other resource categories, such as wildlife, are discontinuous and the area covered by them is not necessarily related to segment length.

The totals for each category are intended to be used as a point of comparison between alternatives. They are not intended to be summed to obtain a corridor total since in some cases resources are included in more than one resource category (such as conifer-aspen and commercial forest) resulting in double-counting. In addition, the relative importance of each resource category differs. A simple total would not reflect this relative difference in importance. It is anticipated that decision makers will consider the relative importance of each resource category and weigh the trade-offs between one resource and another to arrive at a sound decision. No attempt was made to assign importance values to the resource categories in the EIS. The scores are only intended to be used as a comparative tool to weigh environmental factors with other non-environmental factors in the decision making process.

B.2 Resource Categories and Data Item Values

The following resource categories and associated data items are considered to be important and have a reasonable potential to be impacted during construction, operation or maintenance of the project. The seriousness of the expected impact depends on several factors including:

1) Nature of the impact
2) Duration of the impact

3) Time of year the impact is likely to occur
4) Effectiveness of possible mitigation
5) Indirect effects of the impact

Data item values were determined after consultation with BLM and FS, cooperating agencies on the project. Concensus was reached at a joint meeting held in Grand Junction on March 10, 1983. The following is an explanation of the reasoning behind the impact values for all the data items used in the analysis.

Vegetation (Ecotypes)
The vegetation category is composed of those natural vegetative communities discussed in Section 4 that are crossed by the alternative corridors. These include conifer-aspen, saltbush-greasewood, mountain shrub, pinon-juniper, sagebrush-grassland and barren areas. Agricultural lands are also crossed by the corridors; however, these areas are treated under the land use category. Impacts to most vegetation are related to the removal necessary at tower sites and for access roads. Tall trees would be affected by trimming.

Conifer-aspen was rated high in impact potential due to the sustained impact of clearing and cutting of large trees for tower locations and access roads and trimming for electrical clearance. Saltbush-greasewood received a moderate rating because of the difficulty in reclaiming this type, and since many rare plant species are associated with these areas. Mountain shrub was also rated moderate, primarily due to its value to wildlife species, combined with its ability to recover from temporary disturbance. Pinon-juniper and sagebrush-grasslands were rated low due to their wide distribution, limited productivity, and ease of mitigation. Barren areas are low in impact potential since they are nearly devoid of vegetation.

Riparian/Wetlands
Riparian and wetland areas were assessed by examining the various streams crossed by the alternative corridors. Three data items were used--major crossings, perennial stream crossings, and intermittent stream crossings. Major crossings are defined as those where the riparian zone is greater than 1000 ft. and would therefore be difficult to span. Because a potential exists for placing a tower in the riparian zone, major crossings were rated high in impact potential. Other perennial streams with narrow riparian zones could also be affected during construction, but any impact would be of a temporary nature. These crossings are rated moderate in impact potential. A similar argument holds for intermittent streams, but they are less likely to support as lush

a riparian zone. Therefore, intermittent stream crossings are rated low in impact potential.

Geologic Hazard

The geologic hazard category consists of two data items--stable and unstable areas. Unstable areas are inferred to be underlain by landslide deposits and could range anywhere from a low to a high hazard potential according to maps prepared by the USGS (Colton et al. 1975). More detailed descriptions of the hazard categories are provided in Section 4. The unstable areas were rated as moderate in impact potential primarily due to the ability to mitigate the potential problems with appropriate tower location and foundation design. Stable areas were rated low in impact potential.

Visual Resources

An analysis of the visual impact potential was accomplished by combining both the ability of the landscape to conceal the line and the user sensitivity of the area crossed by the line. This process yielded areas of high, moderate, and low impact.

The visual absorbtion capacity (VAC) was determined by a system (described in Appendix C) which combined the existing land forms with vegetation types. Areas of high, moderate, and low VAC were identified using this procedure.

User sensitivity was obtained from several sources. BLM and adjacent public lands in Colorado have been inventoried using the Visual Resource Management (VRM) system. Final sensitivities were obtained for those resource areas located along the corridors. Foresters for the White River, Grand Mesa, Uncompahgre, and San Juan National Forests provided sensitivity ratings for those corridors crossing national forests. Sensitivity ratings for these areas were based on the FS's Visual Management System (VMS). Corridors in New Mexico were rated based on the sensitivity maps included in the Western Area Survey (PSNM 1978). The only areas for which no sensitivity information was available were those within the boundaries of the Southern Ute Indian Reservation. Sensitivity in this area was interpolated from adjacent lands, including Indian lands in New Mexico.

The three VAC categories and three sensitivity ratings were arranged in a matrix which yielded nine combinations (Figure B-1).

Areas of low VAC could have a moderate or high impact rating based on sensitivity; moderate VAC areas could range from low to high impact; and high VAC areas could produce a low or moderate impact rating.

Figure B-1
VISUAL IMPACT MATRIX

VISUAL SENSITIVITY	Visual Absorption Capability: LOW	Medium	High
Low	Moderate	Low	Low
Medium	High	Moderate	Low
High	High	High	Moderate

Erosion Hazard

The assessment of the potential for erosion and effects involved an analysis of the soil types crossed by the corridors. Each soil type was placed into a low, moderate, or high erosion hazard category based on mean annual precipitation, elevation, slope, soil texture, and other soil properties. Soils having a high erosion hazard are rated high in impact potential, moderate hazard--moderate potential, and low hazard--low impact potential. Soils with high erosion hazard are more erodible and occur on steeper slopes where temporary disturbance could result in soil loss. Soils of moderate and low erosion hazard are subsequently less susceptible to impact during construction of the line.

Reclamation Potential

The ability of the area to be revegetated to its pre-disturbance condition is also a function of the soil type, and includes such criteria as mean annual temperature, length of frost free season, soil depth, moisture retention capacity, and vegetative cover. Each soil crossed along the corridors was rated as having good, fair, or poor reclamation potential. Soils with poor reclamation potential were rated as having a high potential for impact; fair and good reclamation areas were given moderate and low potential impact ratings, respectively.

Wildlife

The data items included in the wildlife category are mule deer fawning and elk calving areas, mule deer and elk critical winter range, and bald eagle concentration areas. Construction activity in calving and fawning areas during critical breeding times could disrupt reproductive success. However, proper timing of construction could essentially eliminate this impact. Therefore, calving and fawning areas were rated as moderate in impact potential. Critical winter range could be lost if towers and access roads remove important vegetation. These areas are important habitat during the stressful winter months. Construction activity could also temporarily drive deer and elk out of these use areas. Nonetheless, considering the small amount of land affected, and the temporary nature of the construction period, critical winter range was rated as only moderate in impact potential.

Bald eagle concentration areas, which occur primarily along major rivers, were also rated moderate in impact sensitivity. Any direct disturbance to wintering eagles would be limited to the construction period. They would not be expected to be adversely affected over the long term since they would acclimate to the line and support structures. Removal of tall cottonwoods

adjacent to rivers would be the only direct affect to eagle habitat. An indirect effect may result from new access roads which may increase public access to secluded areas and result in increased harassment of these birds.

Land Use

The four land use data items used in the analysis are prime farmlands, irrigated croplands, and nonirrigated croplands and commercial forest. Farmlands have the potential to be impacted during construction through damage of existing crop and compaction of the soil by heavy equipment. However, proper timing and post-construction rehabilitation would limit the duration of the impact. Tower foundations would remove small amounts of land from production, and may affect cultivation practices if they obstruct access to adjacent land or disrupt irrigation systems. However, in almost all cases, crops can still be grown under the line and towers.

Prime farmland is the most important farmland in the study area and was thus rated high in impact sensitivity. Irrigated croplands have a greater potential for impact (due to irrigation systems) than nonirrigated lands and are also rated high. Nonirrigated croplands are rated moderate.

Commercial timber areas located in the Uncompahgre and San Juan National Forests would be removed from production along the length of the line for the life of the project since lands directly under the line would no longer be available for harvesting. Commercial forest was therefore rated high in impact sensitivity.

Human Resources

The distribution of human use areas within the alternative corridors was assessed by categorizing lands along the corridors as high density areas, low density areas, recreation areas, and non-settled areas.

High density areas are defined as those private lands having an average tract size of less than 80 acres. Included in this category are residential and commercial areas, and areas planned for development, as well as small farms and ranches. Corridors crossing these areas would have a high potential for impact; therefore, high density areas were rated as high in impact sensitivity.

Low density areas are those private lands not included in the high density category. These lands have average tract sizes

greater than 80 acres. Included in this category are large farms and ranches, and sparsely settled areas. The relative impact of affecting residents in these areas is far less than in the high density areas. Low density areas are therefore rated low in seriousness of impact.

Public lands, which are designated as nonsettled, are used by a small number of people (hunters, hikers, etc.) and are therefore considered low in human impact sensitivity.

Overall, the scores assigned to these human use areas reflect the preference to minimize effects on area populations by favoring corridors that avoid populated and heavily used lands.

Cultural Resources

The potential for affecting historical and archaeological sites along the alternative corridors was analyzed by identifying those areas of high, medium, and low sensitivity crossed by the corridors. This was done by a professional archaeologist for all alternative corridors (Nickens and Associates 1982). Included in the sensitivity ratings are known prehistoric and historic sites, probable site areas based on nearby field studies, and the professional judgement of the archaeologist. Types of sites, include those listed in the National Register of Historic Places, sites eligible for listing, and sites that need further study or have not been evaluated for register status. Areas of high sensitivity were given a high potential impact rating, medium sensitivity areas a moderate rating, and low sensitivity areas a low impact rating.

Direct impacts to sites would be avoided or properly mitigated. However, indirect effects caused by vandals or collectors as a result of improved access may pose a more serious impact than that from the direct effect of project construction.

Paralleling Existing Rights-of-Way

All of the various alternative corridors parallel existing transmission lines for at least part of their length. Three different lines could be paralleled--Colorado-Ute's 115-kv line, supported by wood-pole H-frame structures, Western's 230-kv line supported by steel lattice towers, and PSC's 230-kv line supported by H-frame support structures.

The Federal Land Policy and Management Act of 1976 directs federal land managers to combine ROWs over federal lands to the extent practical in order to minimize adverse environmental impacts and the proliferation of separate ROWs. Therefore, an

effort was made to locate and evaluate corridors along the existing transmission lines noted above.

In most cases, paralleling an existing ROW can have several advantages. It can greatly reduce the amount of new access road construction required, and therefore, reduce the impact that would have resulted from a completely new ROW. Less impacts would generally be expected on vegetation, soils, cultural resources, wildlife, visual resources and land-use from the reduced road construction.

Paralleling an existing ROW could, conversely, result in greater impacts than if the lines occupied two independent ROWs. The two lines in close proximity to each other could essentially create a synergistic effect depending on the location of the first line. For example, a single line may be hard to detect from an observation point, but the addition of the second line may call attention to both of them, thus increasing the resultant impact. The advantage or disadvantage can only be determined by examining the particular circumstances in those areas where the ROWs would abut.

Appendix C

Visual Absorption Methodology

Appendix C

VISUAL ABSORPTION CAPABILITY SYSTEM

The visual absorption capability (VAC) system is conceptually based on the FS Visual Management System. This method of assessment provides for a broadscale analysis, well suited for the extensive study area surveyed for this project. The study was performed for the purpose of comparing the alternative corridor segments and substation sites on the basis of potential visual impact, and the methodology was developed accordingly. It was not intended that the VAC study provide site-specific detail suitable for identifying sensitive areas within the corridor segments. User sensitivity and VAC are combined into an analysis of visual impact potential described in Appendix B.

The VAC areas were identified through the use of map overlays. Landforms and vegetation types were delineated on separate sets of maps. The information on these maps was then combined, according to a landform vegetation matrix, into VAC categories. The viewer sensitivity element was taken into account by the last step, which downgraded areas crossed by roads or occupied by recreational facilities.

Landform

The landform categories used in the analysis are shown in Table C-1. These areas were marked on 1:250,000 topographic maps according to the definitions given in the table. These categories were chosen to reflect broad topographic types which could be easily distinguished at the 1:250,000 scale.

Vegetation

The vegetation types were derived from information presented in Soil Conservation Service county vegetation maps. This information was transferred to 1:250,000 maps in order to be compatible with the landform information. The vegetation categories, defined in Table C-2, were developed to simplify the assessment process by combining several similar types into a few general categories. Rather than consider each type of rangeland individually, for example, a general rangeland category was set up to include all short grasses and shrubs. These general categories reflect visual, not necessarily biological, characteristics.

VAC Categories

The six landform categories and the six vegetation types were arranged in a matrix, shown in Table C-3. A low, medium, or high VAC was assigned to each square in the matrix, based on the

ability of each landscape to conceal the proposed project. A forested, mountainous area was considered to have a higher VAC than an open grassland, since the trees and terrain can provide more opportunity for feathering the ROW and screening the towers. As an example, aspen forests were rated lower than conifer forests because of the necessity to remove, rather than top, aspen trees in the ROW.

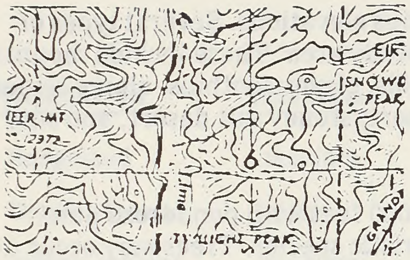
The VAC categories were then mapped for the entire study area by overlaying the landform maps and the vegetation maps with a third set of 1:250,000 maps, and applying the matrix categories to the resulting landscape types.

Since the visual impact of the project is affected by its proximity to the viewer and the frequency with which it is seen, the last step in this process was to incorporate a human element into the VAC categories. This was done by marking roads and recreation facilities on the 1:250,000 VAC maps and subsequently downgrading high and medium VAC areas; that is, a road ROW in a high VAC area was reclassified as medium VAC. In this manner, traveled or populated areas were taken into consideration as being more susceptible to visual impact.

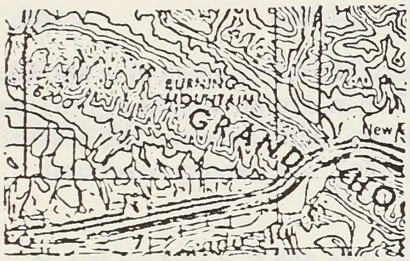
The finalized VAC categories are shown in Figure 4-9, and located for each alternative corridor in the segment profiles found in Section 4.12.

Table C-1

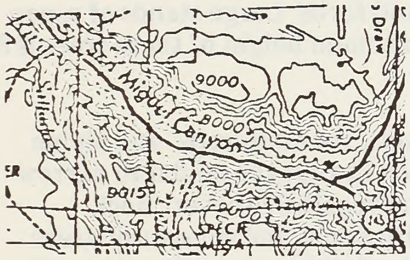
DEFINITION OF LANDFORM CATEGORIES



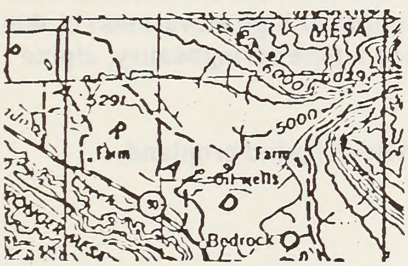
Mountainous — Mountainous areas were determined by concentrated contour lines at high elevation, denoting rugged steep terrain.



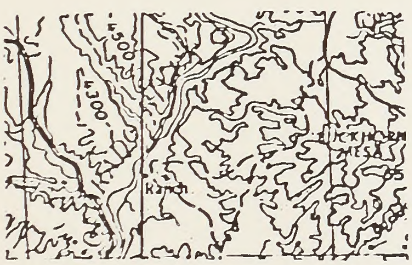
Hilly, Cliffs — These areas form the transition zone from mountainous to broad valley (hilly) and from mesa to broad valley (cliffs).



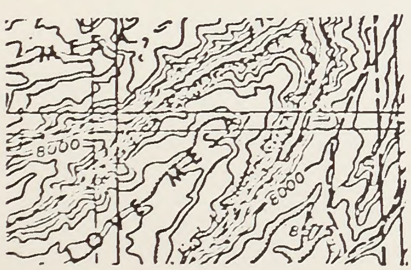
Canyon — Canyons are steep river valleys denoted by highly concentrated contour lines.



Broad Valley — Broad valleys are defined as relatively flat open stretches, with only moderate variation in terrain.



River Valley — River valleys are characterized by moderately steep terrain surrounding the river or creek.



Mesa — Mesa are defined as flat, open spaces at high elevation, bounded by cliffs.

Table C-2
DEFINITION OF VEGETATION CATEGORIES

Rangeland — Rangeland includes grass and scrublands at various elevations. Several types of rangeland, as defined by SCS, occur within the study area. These include mountain loam, brushy loam, subalpine loam, loamy foothills, clayey foothills, alpine slopes, sandy foothills, loamy salt desert, clayey salt desert, stoney salt desert, and silty salt desert.

Conifer forest — The conifer forest occurs between 6,500 and 12,000 feet with ponderosa pine, Engelmann spruce and subalpine fir as characteristic species. Trees may occur in dense stands 60 - 100 feet tall. Ponderosa pine and Douglas fir may obtain heights of 200 feet or more.

Pinyon-juniper — Pinyon-juniper areas are conifer woodlands characterized by pinyon pine and Utah juniper occurring between 6,000 and 7,500 feet. The maximum height of the trees ranges from 26 to 33 feet. This community is typically found between the deseret or grasslands and the conifer forest of higher altitudes. The canopy cover and grass-sagebrush understory are variable.

Aspen — Aspen woodlands generally occur between 9,500 and 10,500 feet and consist of quaking aspen with a lush understory of grasses and forbs. Large stands of aspen occur in moist areas with fairly deep soils. The maximum height of these trees is 80 to 100 feet.

Barren — Barren areas within the study area include badlands, rock outcrops, and alpine rockland. Typical badlands are areas where erosion has cut the land into narrow ravines, sharp crests and pinnacles with little or no vegetative cover. Rock outcrops may occur in any of the vegetation classifications and consists of areas where rock formations, primarily sandstone, protrude from the soil surface. The alpine rockland areas are boulder fields and talus slopes at high elevations (11,000 to 13,000 feet). Vegetation is sparse but may include alpine springbeauty, alpine mountain sorrel, tiny hawksbeard and others.

Agriculture — Areas delineated by SCS to include irrigated and non-irrigated cropland, pastureland, and hayland.

Sources:

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Table C-3
VISUAL ABSORPTION CAPABILITY MATRIX

VEGETATION	LANDFORM					
	Mountainous	Canyon	Mesa	Hilly Cliffs	Broad Valley	River Valley
Rangeland	medium	low	low	medium	low	low
Conifer forest	high	medium	medium	high	medium	medium
Pinyon-juniper	medium	low	low	medium	low	low
Aspen	medium	low	low	medium	low	low
Barren	medium	low	low	low	low	low
Agriculture	low	low	low	low	low	low

Appendix D

Electric Effects

APPENDIX D
ELECTROSTATIC AND ELECTROMAGNETIC FIELD EFFECTS
CALCULATIONS AND PREDICTIONS
FOR THE
RIFLE-SAN JUAN 345-KV TRANSMISSION LINE

A. Radio Interference (RI)

The predicted fair weather RI on the Rifle-San Juan 345-kv line was calculated using the method developed by Bonneville Power Administration and is shown in Figure D-1. The "heavy rain" or foul weather condition is predicted to be 21 decibels (dB) greater than the fair weather values (Electric Power Research Institute 1975).

The quality of radio reception depends upon the size and configuration of the conductors, weather conditions, the strength of the radio signal and the distance of the receiver from the transmission line. It is normally expressed as a ratio of the radio station signal strength to the level of background interference (in this case, any transmission line radio interference). These signal-to-noise ratios (SNRs) are usually expressed in dB. The Institute of Electrical and Electronics Engineers developed the guidelines shown in Table D-1 in 1965 to classify the quality of radio reception.

B. Audible Noise

Predicted levels of audible noise are shown in Figure D-2.

C. Electrostatic Field Calculations

The electrostatic (electric) field results from the voltage of the conductors. The strength, or intensity, of this field increases with increased conductor voltage and decreases as the distance from the conductor is increased. Other factors affecting the electric field intensity are conductor size, phase spacing, ground clearance, terrain, and vegetation in the immediate vicinity of the line.

Ground level electric fields have been calculated for the proposed project and are shown on Figure D-3. As indicated, electric field strength is very dependent upon location with respect to the conductors. Field strength decreases rapidly as one moves laterally from beneath the conductors, and as one remains beneath the conductors but moves longitudinally away from the low point of sag.

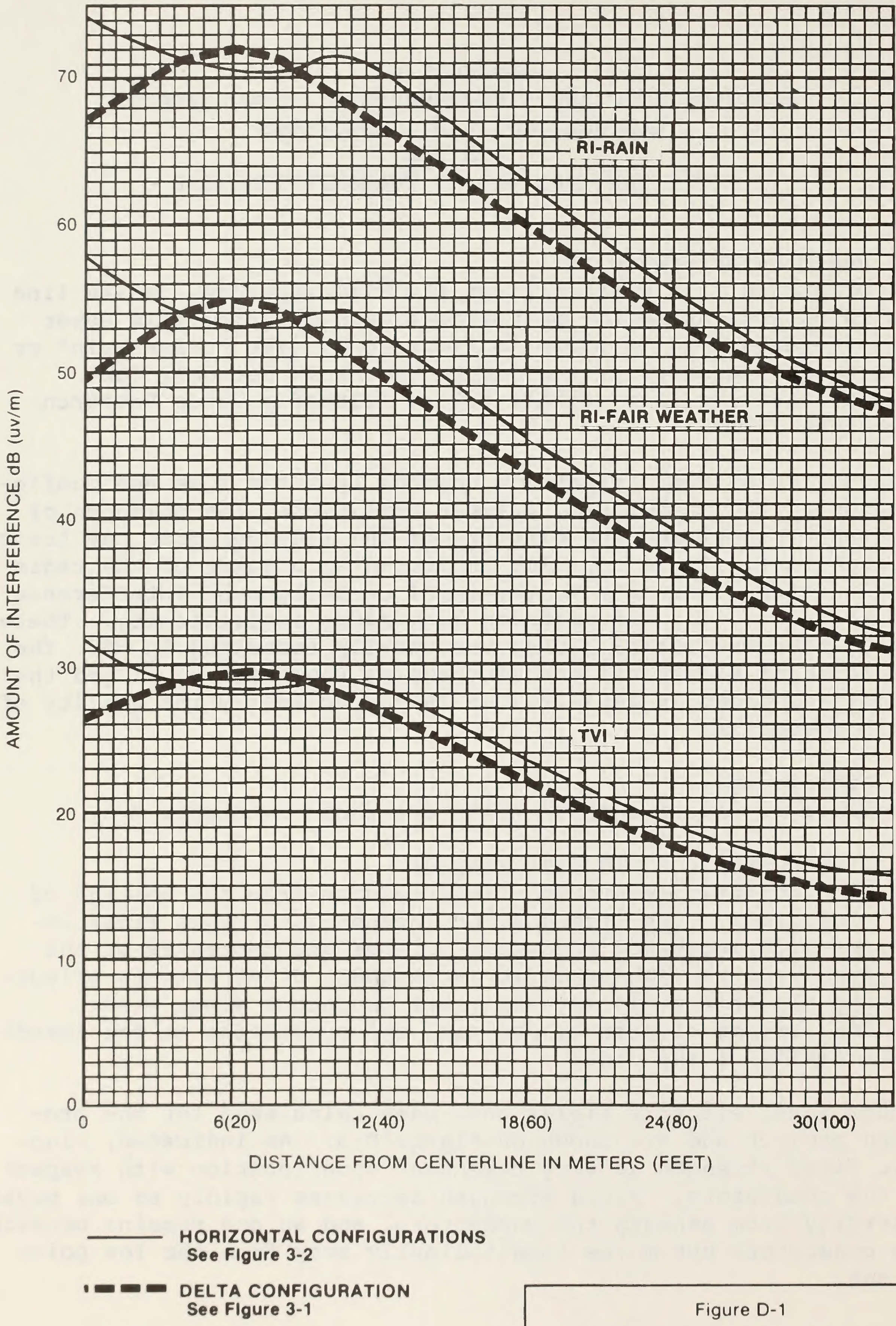


Figure D-1

PREDICTED RADIO AND TV INTERFERENCE (RI AND TVI) FROM THE RIFLE—SAN JUAN TRANSMISSION LINE

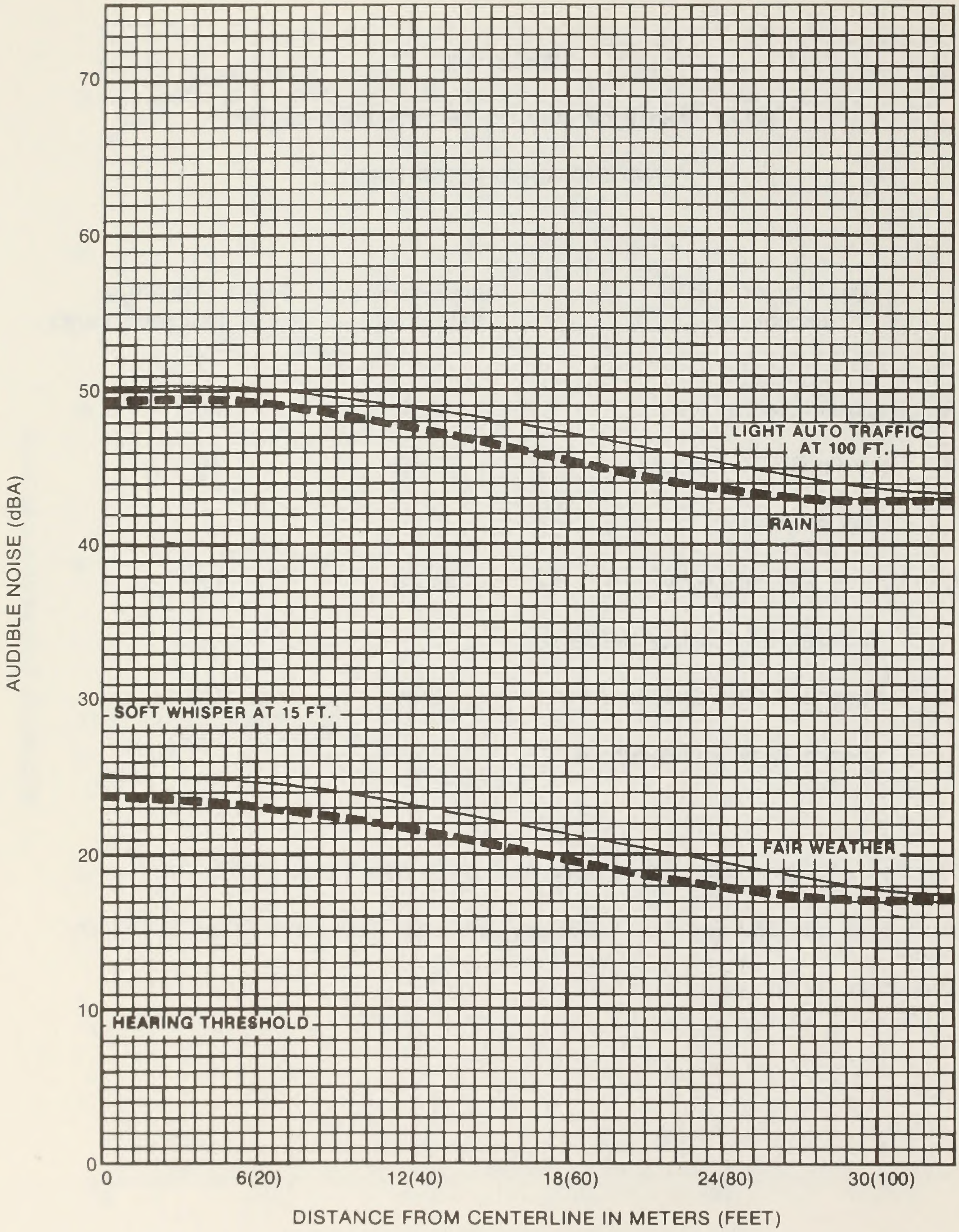
Table D-1

RELATIONSHIP OF QUALITY OF RADIO RECEPTION

AND SIGNAL-TO-NOISE RATIO

Quality of Radio Reception	Signal-to-Noise Ratio (dB)	Signal-to-Noise Ratio (Microvolts/M)
A. Entirely Satisfactory	32 dB	40/1
B. Very Good, Background Unobstructive	27 dB	24/1
C. Fairly Satisfactory, Background Plainly Evident	22 dB	13/1
D. Background Very Evident, but Speech Easily Understood	16 dB	7/1

The Federal Communication Commission (FCC) specifies 24 dB (16/1 ratio) as the SNR for "satisfactory service" (Electric Power Research Institute 1975).



HORIZONTAL CONFIGURATION
(See Figure 3-2)

DELTA CONFIGURATION
(See Figure 3-1)

Figure D-2

PREDICTED AUDIBLE NOISE FOR THE RIFLE—SAN JUAN TRANSMISSION LINE

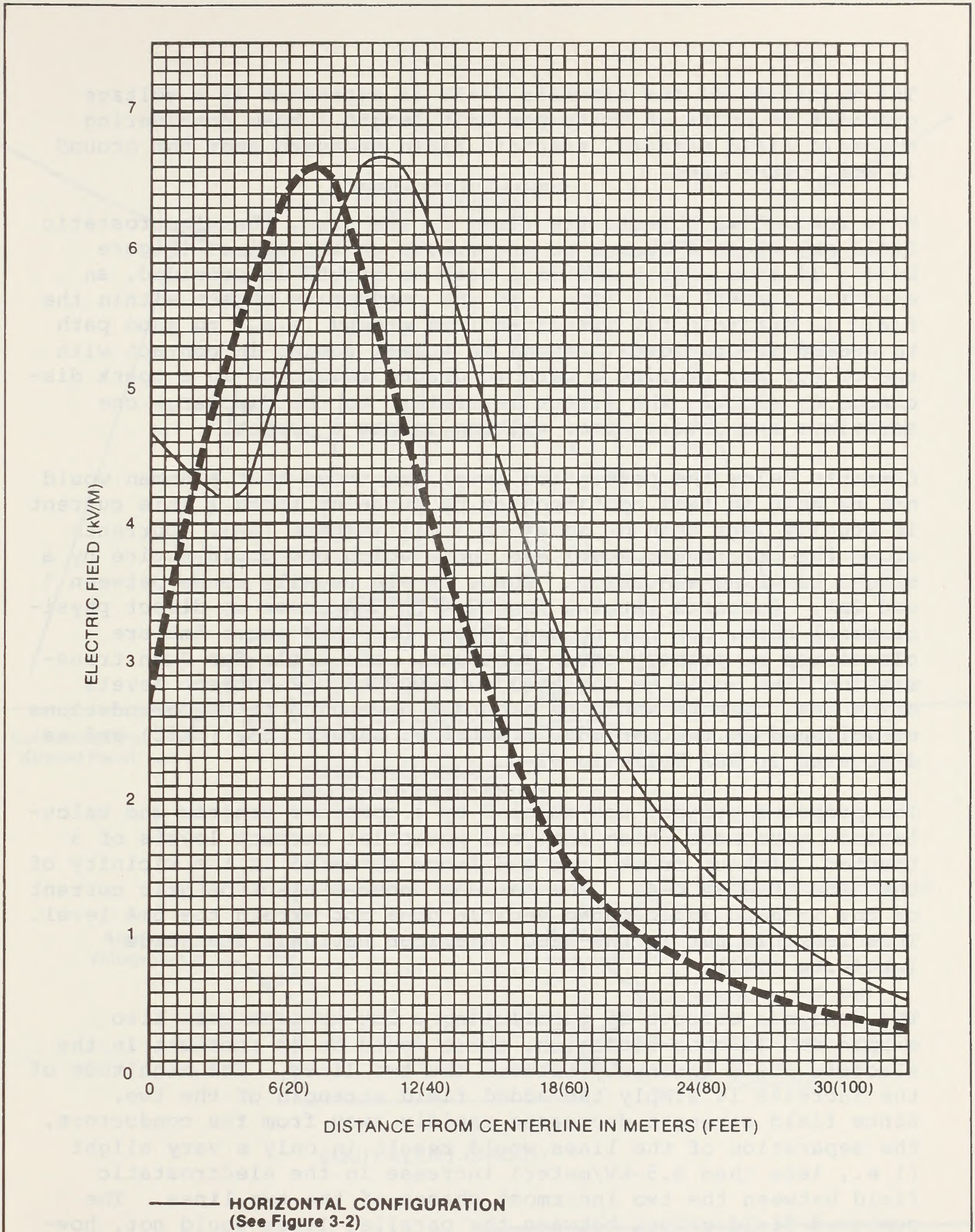


Figure D-3

CALCULATED ELECTRIC FIELD STRENGTHS FOR THE RIFLE—SAN JUAN TRANSMISSION LINE

The magnitude of the electric field is expressed as a voltage gradient in units of volts per unit length. When considering electric field effects, electric field strength near the ground is most often used.

When conductive objects are close to the line, the electrostatic field may cause a charge to accumulate on the object (Figure D-4). If this occurs and if a path to ground is provided, an electric current will flow. If the conductive object within the field is sufficiently insulated from ground (i.e., no good path to ground is provided), person or animal coming in contact with the object may provide a path to ground resulting in a spark discharge or shock. The effect is similar to the discharge one sometimes encounters after walking across a carpet.

Currents below the perception level are those that a human would not be able to feel continuously by sense of touch. This current is usually less than or equal to 1 milliampere (mA). Currents above the perception level are those which one could notice by a slight tingling sensation. These levels usually range between 1 and 2mA. Currents ranging from 2mA to 5mA cause no direct physiological harm, but may be annoying. Currents above 5mA are classified as primary shock currents. The Rifle-San Juan transmission line would be designed to keep induced current levels below 5mA. Fences would be grounded according to recommendations established by the National Electrical Safety Code (NESC) and as discussed in REA Bulletin 62-4.

The proposed project was modeled by a computer program and calculations were made which analyzed potential current levels of a tractor, pick-up truck, car and fence situated in the vicinity of the line (Figure D-5). The maximum induced electrostatic current of the largest anticipated vehicle does not exceed the 5mA level. This level is set in the NESC (American National Standards Institute 1981).

The combined effects of paralleling a 230-kv line were also examined. In this situation, there would be an increase in the electric field intensity between the two lines. The magnitude of the increase is simply the added field strength of the two. Since field strength decreases rapidly away from the conductors, the separation of the lines would result in only a very slight (i.e., less than 0.5-kV/meter) increase in the electrostatic field between the two innermost phases of the two lines. The combined field effect between the parallel lines would not, however, result in an increase in field strength capable of causing a noticeable impact. On either side of the combined ROW there

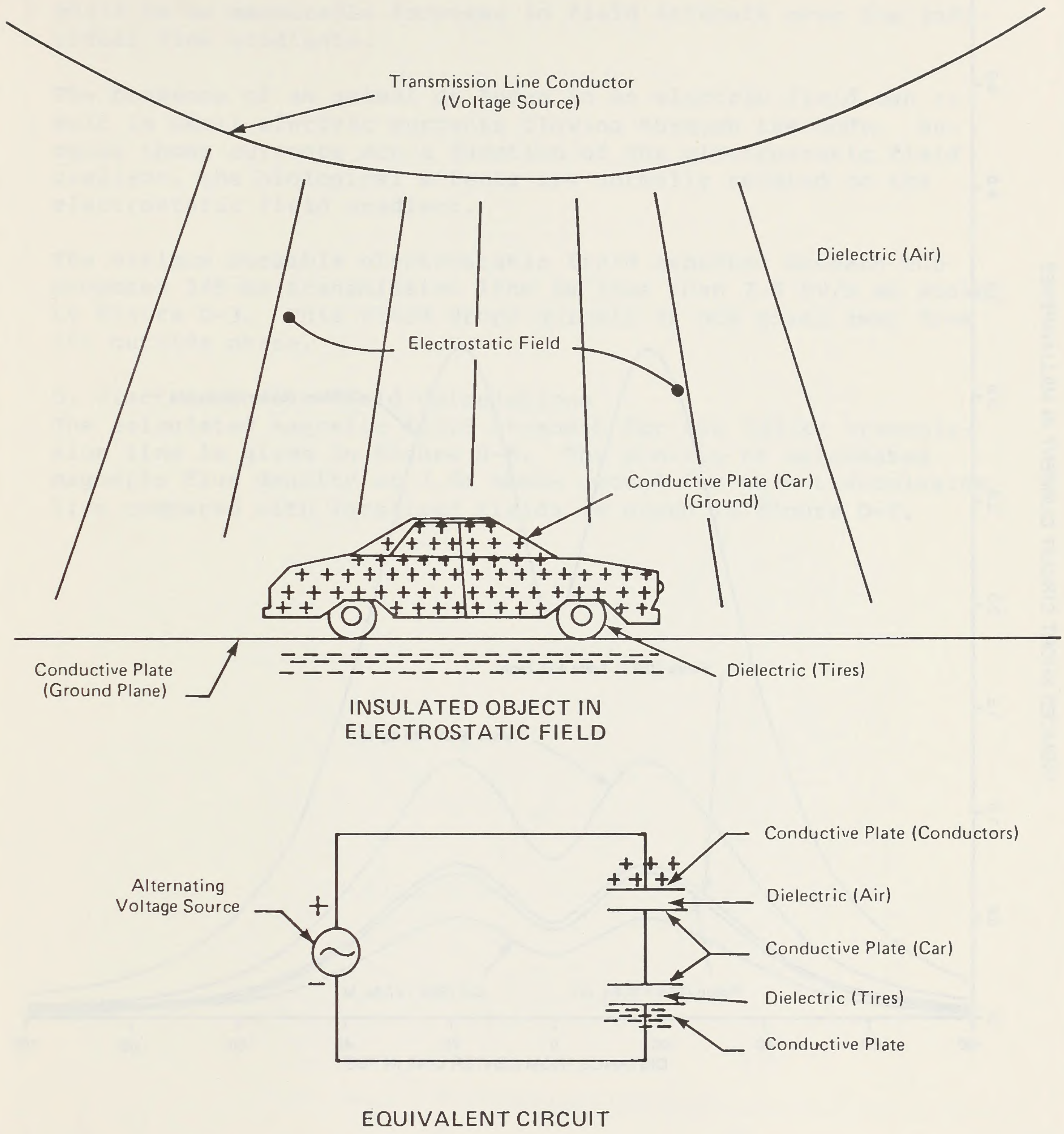


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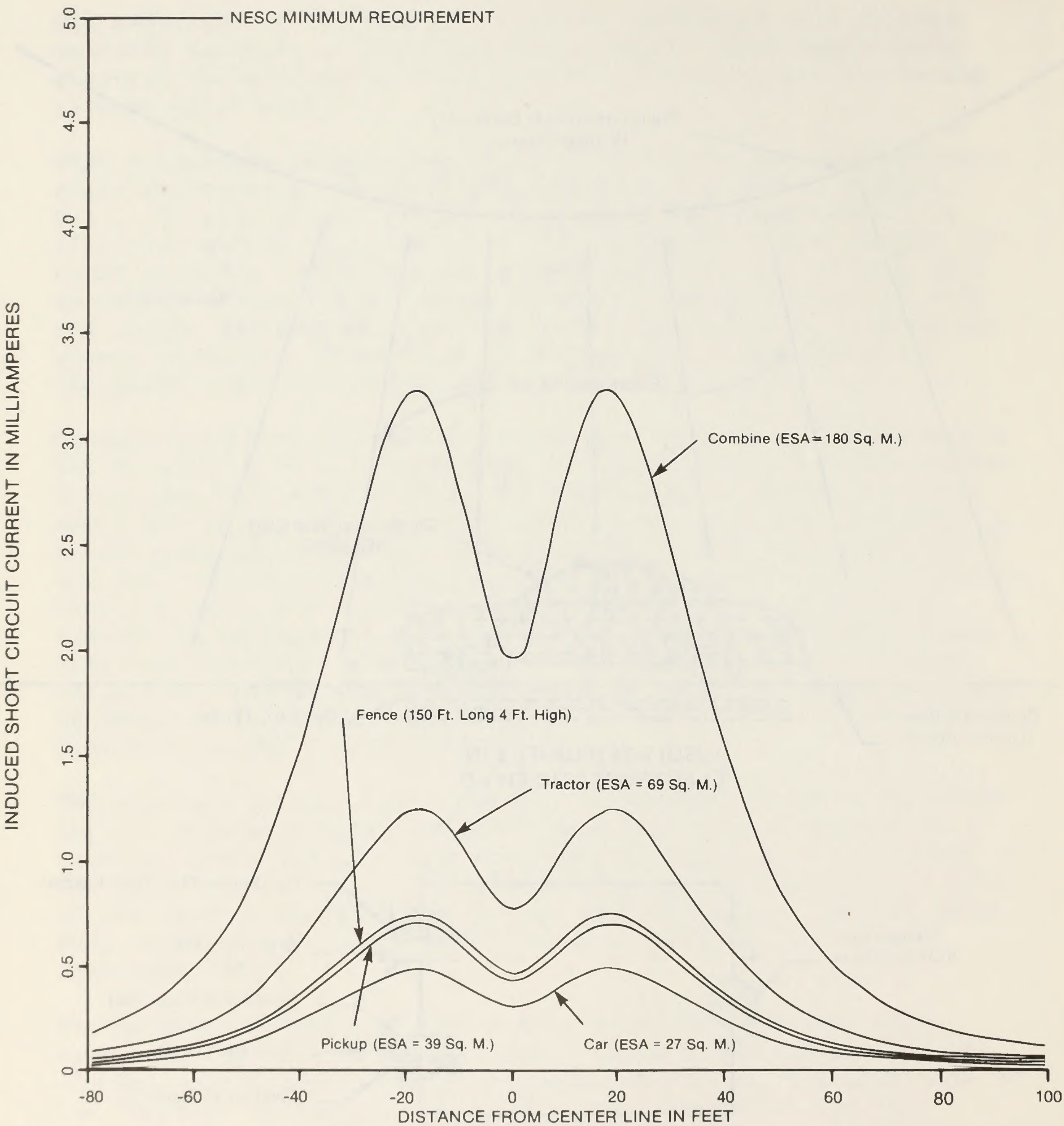
Figure D-4
ELECTRICAL DIAGRAM
OF INSULATED OBJECT
IN ELECTROSTATIC FIELD

COLUTE 78-069-4-001 ENV. ANAL., RIFLE-SAN JUAN TRANS. LINE



NOTES: 1. ESA — Equivalent Surface Area

Figure D-5

PREDICTED SHORT CIRCUIT CURRENT — FOR THE RIFLE-SAN JUAN TRANSMISSION LINE

would be no measurable increase in field strength over the individual line gradients.

The presence of an animal or human in an electric field can result in small electric currents flowing through the body. Because those currents are a function of the electrostatic field gradient, the biological effects are normally related to the electrostatic field gradient.

The maximum possible electrostatic field expected beneath the proposed 345-kv transmission line is less than 7.0 kV/m as shown by Figure D-3. This field drops quickly as one moves away from the outside phase.

D. Electromagnetic Field Calculations
The calculated magnetic field strength for the 345-kv transmission line is given in Figure D-6. The profile of calculated magnetic flux density at 1.5m above ground for this transmission line compared with localized fields is given in Figure D-7.

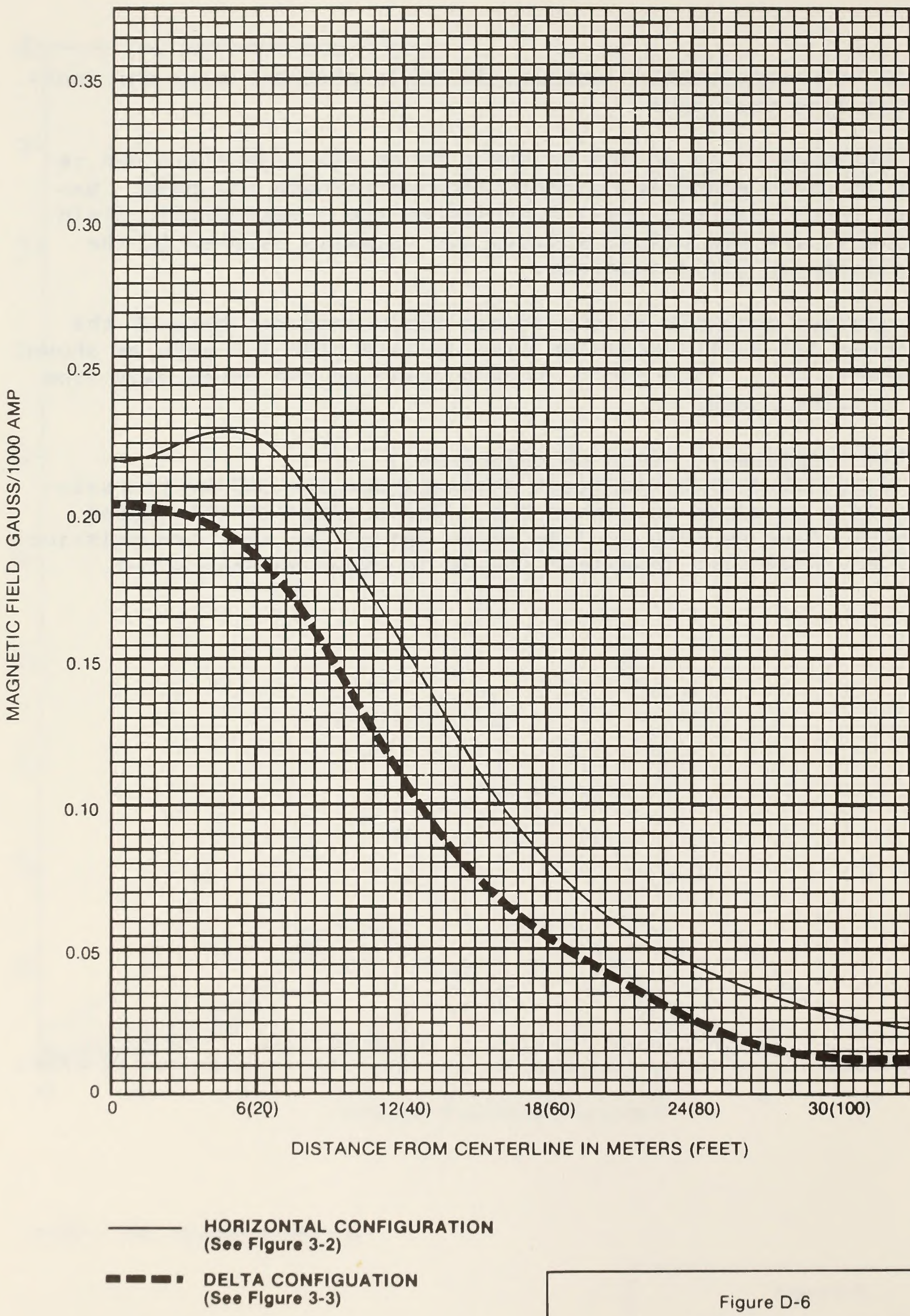


Figure D-6

CALCULATED MAGNETIC FIELD STRENGTHS FOR THE RIFLE— SAN JUAN TRANSMISSION LINE

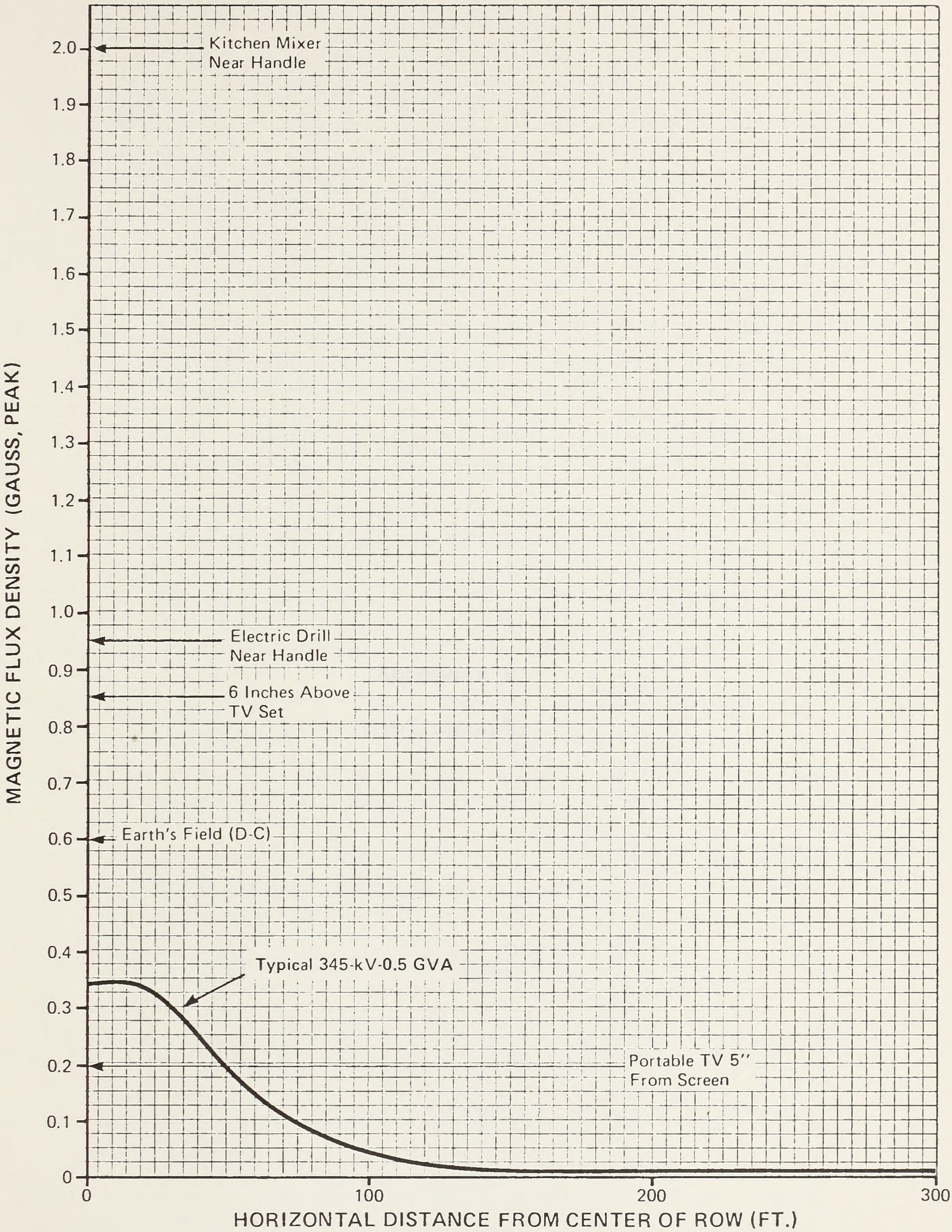


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Figure D-7

PROFILE OF CALCULATED MAGNETIC FLUX DENSITY (60 Hz) AT 1.5M ABOVE GROUND FOR THIS TRANSMISSION LINE COMPARED WITH LOCALIZED FIELDS

Appendix E

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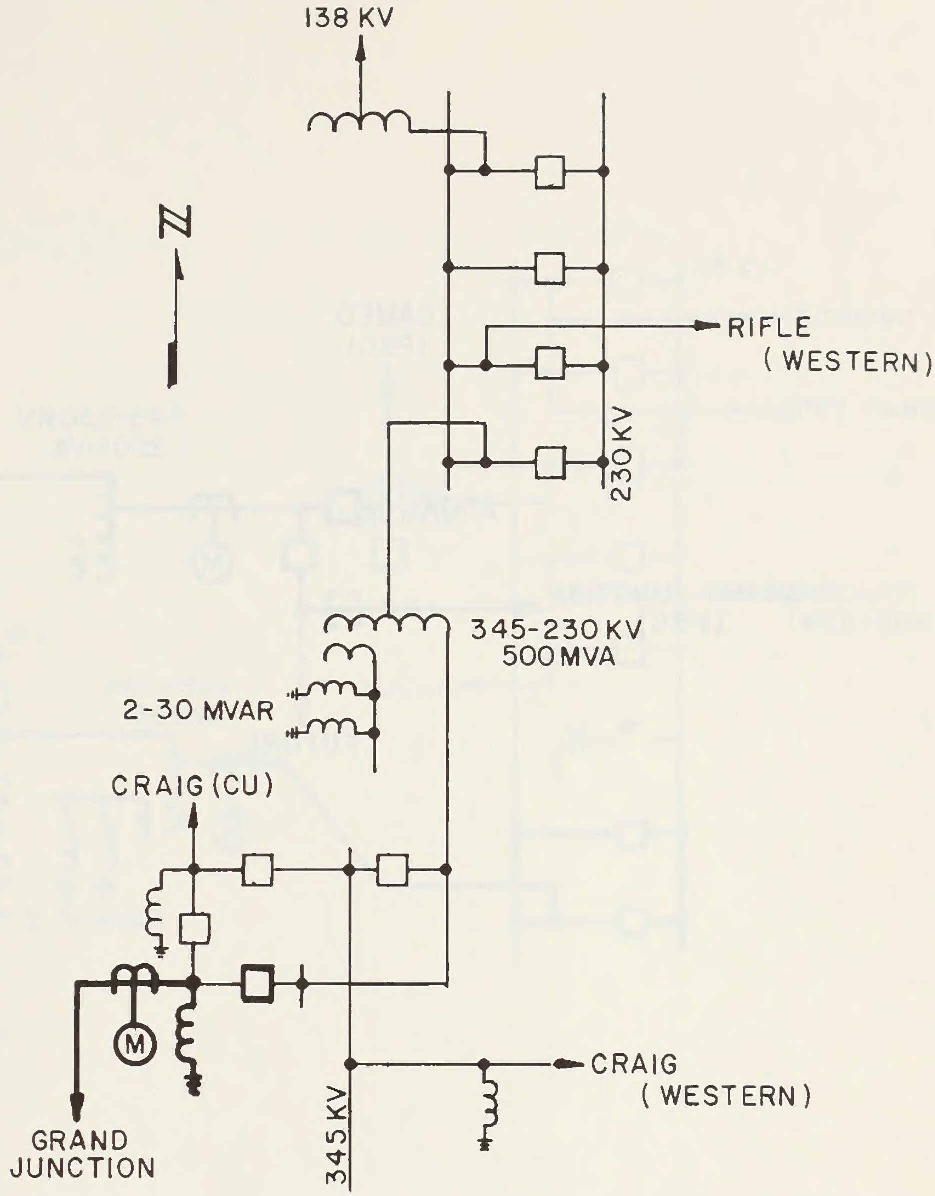
Appendix F

One-Line Diagrams of Project Substations



LEGEND

CIRCUIT BREAKER

POWER TRANSFORMER

REACTOR

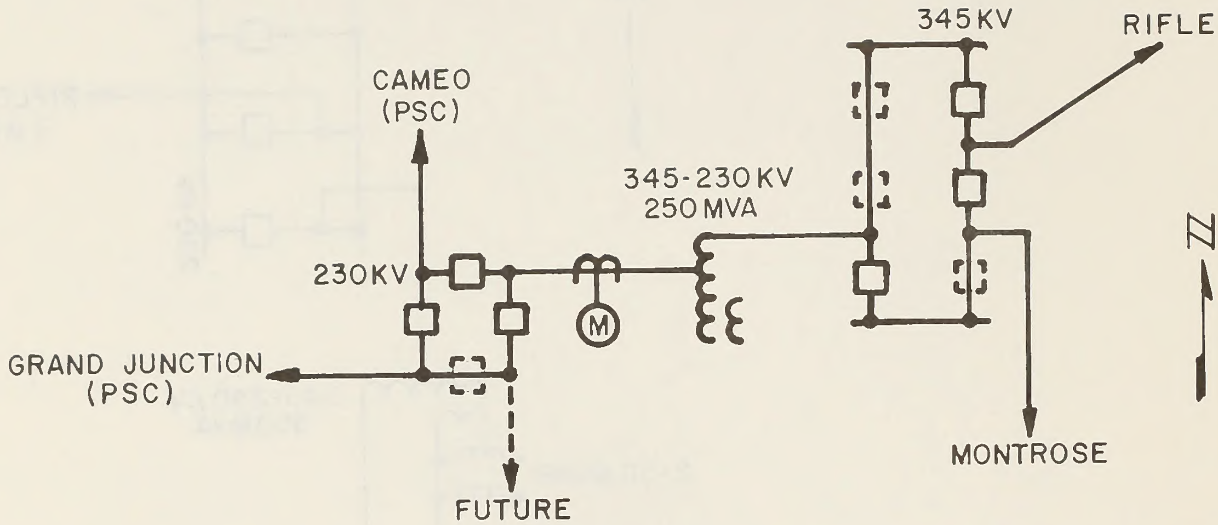
METER

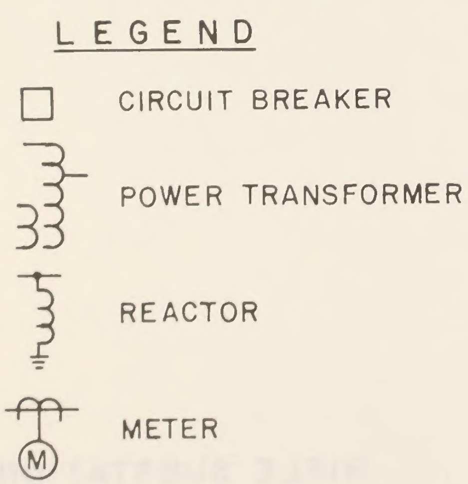
EXISTING

ADDITIONS

RIFLE SUBSTATION
ONE-LINE DIAGRAM

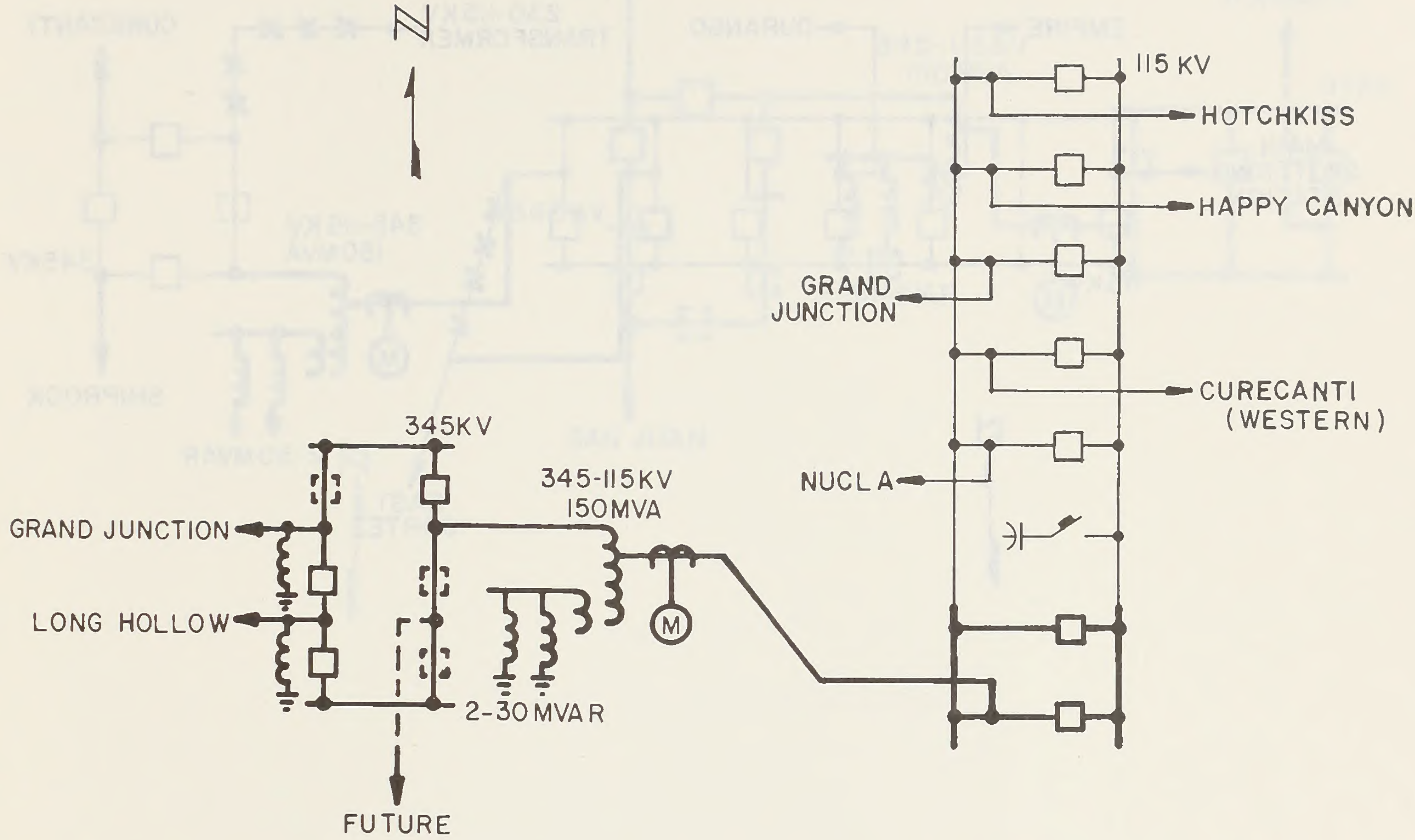
MARCH 1983





GRAND JUNCTION 345KV SUBSTATION
ONE-LINE DIAGRAM

MARCH 1983

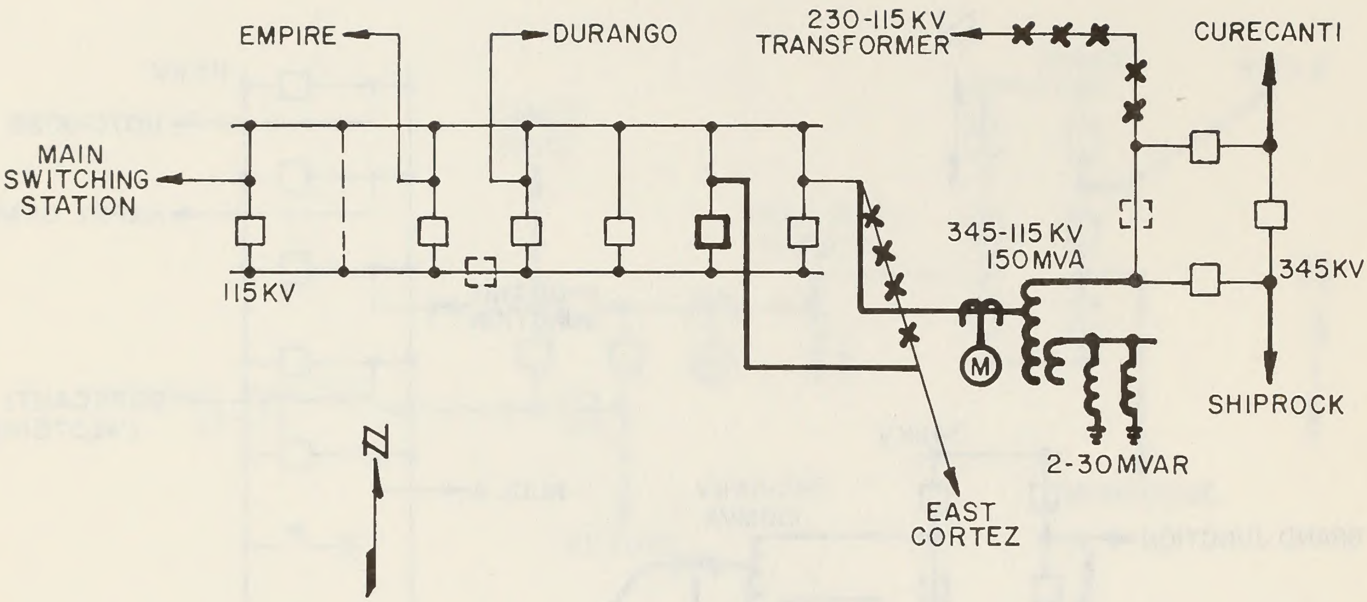


LEGEND

- CIRCUIT BREAKER
- POWER TRANSFORMER
- REACTOR
- METER
- EXISTING
- ADDITIONS
- CAPACITOR
- CIRCUIT SWITCHER

MONTROSE 345KV SUBSTATION
ONE-LINE DIAGRAM

MARCH 1983



LEGEND

CIRCUIT BREAKER

POWER TRANSFORMER

REACTOR

METER

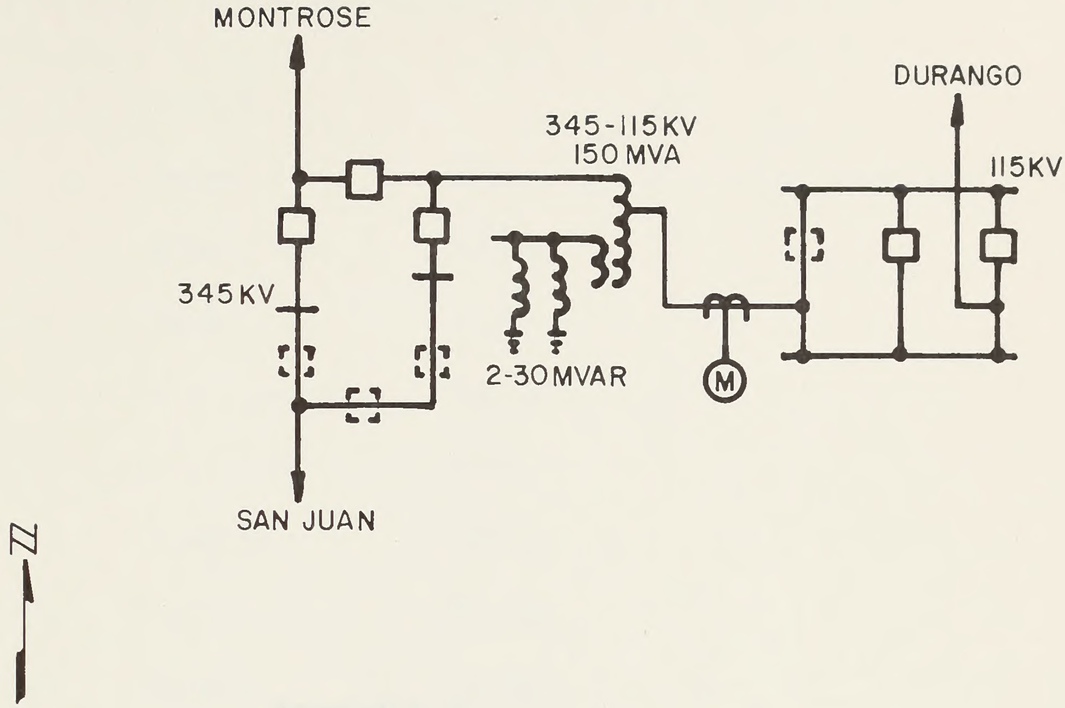
EXISTING

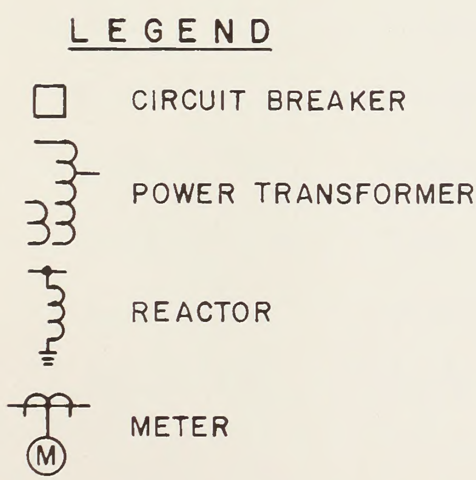
ADDITIONS

REMOVED

LOST CANYON 345 KV SUBSTATION
ONE-LINE DIAGRAM

MARCH 1983





LONG HOLLOW 345KV SUBSTATION
ONE-LINE DIAGRAM

MARCH 1983

Appendix G

List of Project Meetings

Appendix G

Rifle-San Juan 345-kv Transmission Line

Colorado-Ute Meetings with Public and Federal, State and Local Officials

DATE	LOCATION	WITH
29 August 1979	Denver	Federal, State & Local Officials
10 September 1979	Rifle	Public
11 September 1979	Ouray	Public
11 September 1979	Grand Junction	Public
12 September 1979	Dove Creek	Public
13 September 1979	Montrose	Public
14 September 1979	Cortez	Public
17 September 1979	Norwood	Public
18 September 1979	Delta	Public
20 September 1979	Durango	Public
21 September 1979	Farmington	Public
9 October 1979	Cortez	County Planning Commission
11 October 1979	Montrose	Colorado Division of Wildlife, Federal Aviation Administration
16 October 1979	Ignacio	Southern Ute Indian Tribe
23 October 1979	Hotchkiss	Public
28 November 1979	Denver	BLM
3 December 1979	Delta	FS
8 January 1980	Montrose	BLM
9 January 1980	Grand Junction	BLM

DATE	LOCATION	WITH
3 April 1980	Hotchkiss	Public
25 April 1980	Ignacio	Southern Ute Indian Tribe
29 April 1980	Delta	Development Coordinator
6 May 1980	Mancos	Public
21 July 1980	Delta	Board of County Commissioners
23 July 1980	Ignacio	Southern Ute Indian Tribe
24 July 1980	Montrose	County Planning Commission
6 August 1980	Durango	Board of County Commissioners
11 August 1980	Delta	Public
11 August 1980	Glenwood Springs	Board of County Commissioners
11 August 1980	Telluride	Planing Commission
19 August 1980	Cortez	County Planning Commission
8 September 1980	Grand Junction	City/County Development Dept.
8 September 1980	Glenwood Springs	County Planning Commission
15 September 1980	Telluride	County Planning Commission
16 September 1980	Cortez	County Planning Commission
22 September 1980	Delta	Development Coordinator
23 September 1980	Delta	County Commissioners
25 September 1980	Denver	BLM, FS
29 September 1980	Glenwood Springs	Board of County Commissioners
30 September 1980	Mancos	County Planning Commission, Public
1 October 1980	Dove Creek	County Planning Commission
7 October 1980	Ouray	Public

DATE	LOCATION	WITH
13 October 1980	Durango	Animas Regional Planning Commission, Public
14 October 1980	Telluride	County Planning Commission
23 October 1980	Grand Junction	County Planning Commission
29 October 1980	Durango	Animas Regional Planning Commission, Public
10 November 1980	Telluride	County Planning Commission
10 November 1980	Durango	Animas Regional Planning Commission
12 November 1980	Delta	FS
17 November 1980	Dove Creek	County Planning Commission
18 November 1980	Denver	FS
26 November 1980	Durango	Animas Regional Planning Commission
1 December 1980	Dove Creek	Board of County Commissioners
1 December 1980	Durango	Animas Regional Planning Commission
2 December 1980	Grand Junction	Board of County Commissioners
2 December 1980	Ouray	County Planning Commission
8 December 1980	Durango	FS
8 December 1980	Durango	Animas Regional Planning Commission
15 December 1980	Telluride	County Commissioners
17 December 1980	Durango	Board of County Commissioners
31 December 1980	Durango	County Commissioners
5 January 1981	Durango	Board of County Commissioners
20 January 1981	Norwood	County Planning Commission, Public
27 January 1981	Towoac	Ute Mountain Indian Tribe

DATE	LOCATION	WITH
28 January 1981	Ignacio	Southern Ute Indian Tribe
3 February 1981	Mancos	Montezuma and La Plata County Officials, FS Southern Ute Indian Tribe
9 February 1981	Telluride	County Planning Commission
11 February 1981	Cortez	County Officials (Montezuma)
3 March 1981	Orchard City	Town Council, Public
5 March 1981	Telluride	County Planning Commission
9 March 1981	Telluride	County Planning Commission
13 March 1981	Mancos	County Planning Commission, Public
26 March 1981	Cortez	County Administrative Assistant
28 April 1981	Delta	Development Coordinator
30 April 1981	Telluride	Board of County Commissioners
6 May 1981	Cortez	County Officials
11 May 1981	Ouray	Land Use Administrator
12 May 1981	Cortez	County Planning Commission
15 May 1981	Durango	County Commissioner
2 June 1981	Ouray	Planning Commission
2 June 1981	Durango	Board of County Commissioners
5 June 1981	Durango	County Commissioners
10 June 1981	Delta	County Commissioners
16 June 1981	Cortez	County Planning Commission
26 June 1981	Cortez	County Planning Commission

DATE	LOCATION	WITH
7 July 1981	Norwood	County Planning Commission Board of County Commissioners
4 August 1981	Telluride	County Commissioners
11 August 1981	Durango	Public
12 August 1981	Farmington, N.M.	Public
13 August 1981	Montrose	Public
10 September 1981	Norwood	County Commissioners, Public
14 September 1981	Cortez	County Commissioners, Public
25 September 1981	Denver	County Commissioners, Public
8 October 1981	Norwood	Colorado Geologic Survey, Colorado Natural Areas Program
19 October 1981	Durango	La Plata County Planning Commission
26 October 1981	Delta	Public
26 October 1981	Delta	County Planning Commission, Public, LPEA
24 November 1981	Durango	County Planning Commission, Public, LPEA
24 November 1981	Delta	County Planning Commission
2 December 1981	Durango	County Commissioners
2 December 1981	Ouray	County Commissioners, Planning Commissioners
7 December 1981	Durango	County Commissioners
14 December 1981`	Durango	Planning Commission
17 December 1981	Delta	Development Coordinator
17 December 1981	Ignacio	Southern Ute Indian Tribal Council

DATE	LOCATION	WITH
20 March, 1982	Montrose	Society of American Foresters
30 March, 1982	Delta	FS
3 August 1982	Glenwood Springs	County Commissioners
4 August 1982	Grand Junction	County Commissioners
5 August 1982	Grand Junction	County Commissioners
6 August 1982	Montrose	County Commissioners
10 August 1982	Grand Junction	County Commissioners-Mesa & Delta Delta City Planners
11 August 1982	Durango	Southern Ute Indian Tribe
12 August 1982	Durango	Southern Ute Indian Tribe
12 August 1982	Delta	County Commissioners
16 August 1982	Denver	Governor Lamm
18 August 1982	Grand Junction	County Planner
14 September 1982	Durango	Southern Ute Indian Tribe
15 September 1982	Durango	Southern Ute Indian Tribe County Commissioners
16 September 1982	Glenwood Springs	County Planner
17 September 1982	Montrose	Western, BLM, FS
21 September 1982	Rifle	County Commissioners, Rifle Ski Corporation
24 September 1982	Montrose	Landowner
1 October 1982	Grand Junction	Western, BLM, FS Public Service Company
4 October 1982	Durango	Western, BLM, FS
7 October 1982	Grand Junction	County Commissioners

DATE	LOCATION	WITH
11 October 1982	Grand Junction	County Planner
11 October 1982	Durango	Southern Ute Indian Tribe
12 October 1982	Durango	County Commissioners
13 October 1982	Durango	Landowner
22 October 1982	Grand Junction	County Planner
25 October 1982	Durango	County Commissioners, Forest Service
28 October 1982	Montrose	BLM, FS, Public
29 October 1982	Montrose	BLM
1 November 1982	Ouray	County Commissioners
1 November 1982	Grand Junction	County Commissioners
2 November 1982	Montrose	Western Colorado Congress
3 November 1982	Grand Junction	County Commissioners, Planning Commission, County Planner, BLM
5 November 1982	Glenwood Springs	BLM, Rifle Ski Corporation
8 November 1982	Grand Junction	BLM
8 November 1982	Montrose	County Commissioners
12 November 1982	Grand Junction	County Transmission Planning Study Team
16 November 1982	Montrose	BLM
18 November 1982	Delta	County Commissioners
20 November 1982	Grand Junction	County Transmission Planning Study Team
23 November 1982	Grand Junction	Battlement Mesa Inc.

DATE	LOCATION	WITH
20 November 1982	Grand Junction	County Transmission Planning Study Team
23 November 1982	Grand Junction	Battlement Mesa Inc.
1 December 1982	Delta	County Planner
2 December 1982	Grand Junction	County Transmission Planning Study Team
3 December 1982	Durango	Southern Ute Indian Tribe
9 December 1982	Delta	County Planner
4 January 1982	Delta	County Commissioners
14 January 1982	Delta	Development Staff
11 February 1983	Mancos	FS, County Officials
22 February 1983	Denver	REA, BLM, FS
23 February 1983	Denver	Same as above
24 February 1983	Denver	Same as above
10 March 1983	Grand Junction	Same as above
10 March 1983	Debeque	Public
17 March 1983	Rifle	Public
23 March 1983	Durango	Public
29 March 1983	Montrose	Public
31 March 1983	Palisade	Public
13 April 1983	Rifle	Rifle and Mesa County Officials, PSC
19 April 1983	Montrose	REA, Western, BLM, FS
21 April 1983	Montrose	Garfield, Montezuma, Montrose, Delta, San Miguel and La Plata County Officials, Region 10 Planning, FS, BLM

Appendix H

State Listed Plant Species

Table H-1

STATE LISTED PLANT SPECIES OF SPECIAL CONCERN LOCATED IN THE GENERAL VICINITY OF THE PROPOSED PROJECT

Colorado[a]

- *Aquilegia micrantha* var. *mancosana*
- *Astragalus linifolius*
- *A. lutosus*
- *A. wetherillii*
- *Cryptantha elata*
- *Eutrema penlandii*
- *Festuca dasyclada*
- *Ipomopsis globularis*
- *Penstomen parviflorus*
- *P. retrorsus*
- *Phacelia submutica*
- *Senecio dimorphophyllus* var. *intermedium*
- *Sullivantia purpusii*

New Mexico[b]

- *Aletes macdougalii*
- *Androstephium breviflorum*
- *Aquilegia desertorum*
- *Arabis lignifera*
- *A. selbyi*
- *Astragalus calycosus* var. *scaposus*
- *A. flavus*
- *A. fucatus*
- *A. hallei* var. *hallei*
- *A. humillimus*
- *A. iodopetalus*
- *A. kentrophyta* var. *neomexicana*
- *A. micromerius*
- *A. monumentalis* var. *cottamii*
- *A. mollissimus* var. *thompsomae*
- *A. newberryi*
- *A. naturitensis*
- *A. oocalycis*
- *A. proximus*
- *A. sabulonum*
- *A. shortianus*
- *A. wingatanus*
- *Cammissonia scapoidea*
- *Castilleja chromosa*
- *Cercocarpus intricatus*
- *Eriogonum ovalifolium*
- *Frankenia jamesii*
- *Fritillaria atropurpurea*
- *Gilia formosa*
- *Ipomopsis congesta*
- *Oenothera caespitosa* ssp. *navajoensis*
- *Phacelia splendens*
- *Phlox austromontana*
- *Platyschkuhria oblongifolia*
- *Sclerocactus whipplei* var. *heilei*
- *S. whipplei* var. *reevesii*
- *Trichostema arizonium*
- *Wyethia scabra* var. *canescens*

[a] *Obtained from Colorado Natural Heritage Inventory, Denver, Colorado, 1983.*
[b] *Obtained from New Mexico Heritage Inventory, Santa Fe, New Mexico, 1983.*

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